Energy Policies for the 1980s
An Economic Analysis

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Energy Policies for the 1980s: An Economic Analysis

ONTARIO ECONOMIC COUNCIL
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Trade Policies for Natural Gas and Electricity

J. F. Helliwell

INTRODUCTION

In this paper I raise and attempt to quantify some of the important issues surrounding Canadian exports of natural gas and electricity. To put the recent exports of these commodities in the context of total Canadian energy trade, Table 1 shows the values since 1970 of net Canadian exports of various energy sources. I have been asked to deal specifically with natural gas and electricity, and hence to pass over the policy issues relating to oil, coal, and uranium. The distinction cannot be clear-cut, however, as natural gas and fuel oil are fairly close substitutes in a number of domestic uses, and exports of uranium, and to a lesser extent coal and natural gas, can be interpreted as exports of electricity at an earlier stage of processing.

The net export figures also mask the importance of transport costs and quality differences, which mean that gross trade flows can be large even if the net flows are not. For example, in 1978 gross coal exports (mainly of Western coal to offshore markets) were over 15 million tons, or 45 per cent of production, offset by imports of 15.6 million tons of US coal into Ontario and Quebec. For crude oil and products, exports to the United States were more than imports from offshore (in terms of the trade values shown in Table 1) during the first half of the 1970s, but both before and after that time imports have exceeded exports. By contrast, natural gas and electricity, the two commodities that are the subject of this paper, have tended to be exported with very few offsetting imports.

The data in Table 1 show that the many post-1973 changes in the

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In revising this paper for publication I have made use of helpful written comments from Francois Bregha, Ron Erdmann, Dick Hamilton, Sanford Osler, and Campbell Watkins, as well as suggestions from many participants at the conference.

TABLE 1

Canadian trade balances in energy commodities, net exports (millions of dollars)

	Petroleum	Natural Gas	Coal and Coke	Electricity	Uranium	Total
1970	129	201	-135	22	-34	183
1971	172	244	- 83	37	13	383
1972	344	299	- 90	59	55	667
1973	647	343	- 9	103	69	1153
1974	1045	488	- 84	170	83	1702
1975	171	1084	-160	91	121	1307
1976	-624	1607	- 13	153	241	1364
1977	-1065	2028	- 66	362	208	1467
1978	-1427	2190	- 8	477	646	1878

SOURCE: Statistics Canada (65-202) Exports Merchandise Trade.
Statistics Canada (65-203) Imports Merchandise Trade.

price and quantities of Canada's energy trade have caused individual components to vary a great deal, while the total balance has varied over a relatively narrow range, from a net energy trade surplus of $1.3 billion in 1975 to a high of $1.9 billion in 1978, with the 1979 surplus likely to be higher again.

Even in this introductory comment it is necessary to qualify any statistics that treat the energy trade balance as a single revealing number. There is a temptation to regard the energy trade balance as a leading indicator of the strength of a country's currency (in the way that the United Kingdom's emerging but temporary role as a net oil exporter has stimulated speculation in favour of sterling) or of its insulation against future disruptions in world supply or further sharp price movements of key energy commodities. Economists are fond of speaking of, and even estimating, the degree to which one form of energy can be substituted for another, and there is no doubt that such possibilities are substantial, especially over periods long enough to permit the development and adoption of technologies that make best use of an emerging pattern of energy prices and availability. However, the very different characteristics of the various traded energy commodities mean that the substitution possibilities are inevitably limited, that they will differ in the various regions of the country, and that they will be restricted by the availability and costs of transport and storage. All this leads to my preliminary judgment that the institutions and economic factors governing the exports of electricity and natural gas are so different that they deserve separate treatment.

Before starting into those separate parts of the paper, I shall outline the key issues that relate to each type of export.

The first point to note is that natural gas exports have, during the 1970s, been from 40 per cent to 50 per cent as large as domestic consumption, while net electricity exports have ranged from next to nothing to a 1978 level that was under 6 per cent of domestic consumption. Natural gas has been discovered and developed with export markets in mind, while electricity production tends to be developed to meet requirements within each province, with inter-provincial and international trade used in special cases (e.g. Churchill Falls), to help in the utilization of large and lumpy investments to capacity (e.g. James Bay), and to cut the costs of carrying systems that have been overbuilt because of long construction times coupled with excessive estimates of future demand growth.

A second key distinction between natural gas and electricity is that exports of natural gas inevitably involve questions of equity between present and future generations, because the faster use of low-cost deposits brings forward the time when higher-cost sources will need to be tapped for domestic uses. The division of economic benefits between regions of the country, between resource developers and resource consumers, and between domestic and foreign residents is also more troublesome for natural gas than for electricity, because 85 per cent of the natural gas reserves are in Alberta, and the development, although subject to provincial royalties, is done by firms with an average foreign ownership of 75 per cent.[1] By contrast, the main electrical utilities are either provincially owned or provincially regulated to obtain only a normal rate of return, so that the natural resource values inherent in advantageous hydro sites are passed on either to domestic electricity users or to domestic taxpayers.[2]

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[1] PetroCanada now may have an important impact on the distributional effects of natural gas exports, as it has become, chiefly through the purchase of Pacific Petroleums, the second largest gas producer (after Shell) in Canada. Producer rents that rise through unexpected increases in export market opportunities or wellhead prices now accrue to Canadian residents to a larger extent than previously. Naturally, expected profits from higher wellhead prices and higher export sales were already reflected in the prices that PetroCanada had to pay for Pacific Petroleums and its other properties.

Finally, the decision about how much natural gas to export is intertwined with decisions about how far to extend the domestic distribution system, and the extent to which downstream processing should be encouraged to take place in Canada. For electricity, with the possible exception of Quebec in the 1980s, these issues have already been settled, with the provincial distribution grids already covering almost all the major centres of population. The resolution is less clear with respect to the subsidization of downstream processing. Although most electric utilities do not plan facilities for the export market, and do not view themselves as trading off domestic and export sales as competing uses, it is true that many utilities do price their incremental industrial sales at less than incremental costs and hence subsidize the production of electricity-intensive output, whether for sale in Canada or in foreign markets.

Having briefly listed some of the key issues in exports of electricity and natural gas and shown the contrasts between the two fuels, I now proceed to more detailed analysis on a separate basis. The natural gas section will be much the longer of the two, because there are many more open policy issues, because the size of the actual and potential export trade is much larger, and because there are many more conflicting interests in play.

NATURAL GAS EXPORTS: SELLING THE FARM OR SAVING THE BACON?

Historical background

Natural gas exports, pipelines, and export proposals have been key issues in Canadian energy policy since before there were any federal policies or institutions to implement them. The federal Liberal government was defeated in 1956 because of the methods they were using to obtain passage of bills providing federal financial support for the TransCanada Pipeline, and the Borden royal commission was established, in October 1957 by the new Conservativegovernment to make recommendations on energy export policy and on the regulation of pipeline tariffs, to study the potential role of a National Energy Board, and to study some features of the financing and operation of TransCanada PipeLines.

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[2] Except for the electricity generated from the few large privately owned hydro installations and exported in the form of processed aluminium or some other electricity-intensive products. About 12 per cent of Canadian electricity production in 1978 was generated by industrial firms, chiefly for their own use. As noted below, some of the natural resource values in low-cost sources of electricity are passed on to US purchasers by the procedures for pricing electricity exports.

The First Report of the Royal Commission on Energy (1958) recommended that 'the export from Canada of natural gas, which may from time to time be surplus to the reasonably foreseeable requirements of Canada, be permitted under licence.'(1). The royal commission also concluded that 'due to accepted principles of pipeline financing and possible delays in construction, it appears to be necessary to grant export licences for a period somewhat longer than 20 years.'[3] The commission also heard evidence that Westcoast Transmission had contracts to sell gas to BC Electric (to service the lower mainland of the province) at 32¢ per thousand/cubic feet (mcf) while exporting gas to the United States at 22¢/mcf. This, the commission heard, meant that 'the operating profits of Westcoast were coming solely from the Canadian consumer and no profit was being made by Westcoast in carrying out the terms of its contract with Pacific Northwest.'(23) Hence the commission concluded that 'the export contract should contain fair and reasonable provisions for price adjustments during the term of the contract, so that the exporter, and in turn the gas producers, will participate in any benefits accruing from general price increases occurring in the export markets.' No concern was raised about the possible distribution of these higher wellhead values between residents and non-residents or between the producing companies and the crown.

In the light of the Borden royal commission's espousal of the principle of long-term gas export contracts and the National Energy Board's subsequent acceptance and application of this feature, it became especially important to foresee far-future demands for Canadian gas consumption. Thus the commission prepared estimates of Canadian natural gas demand and likely discoveries through the 1980s. It underestimated substantially the speed of the expansion of the Canadian market until the mid-1970s, perhaps because it did not pay sufficient attention to the method by which pipeline tariffs are set. This conventional method charges each year's user straight-line depreciation (on an historical cost basis) plus a rate of return on the remaining rate base. This method produces a tariff that is highest in real terms at the beginning of the pipeline's life and declines thereafter. Thus it was that Westcoast contracted to sell gas to BC Electric at 32¢/mcf in 1958 and was selling gas to BC Hydro at 29¢/mcf in early 1974. This 'front-end loading' may make financing easier to obtain, but it tends to increase the insistence of an export buyer on long-term contracts for gas exports using new facilities, because no one likes to pay more than his share of costs in early years and then be denied access to the facilities during their underpriced later years. The conventional tariff formula was applied to all the main transmission and distribution utilities in Canada, which were mostly put into service in the late 1950s, and it produced burner-tip gas prices that declined significantly, compared to commodities in general and to other forms of energy between 1958 and 1973. This led initially to very low wellhead prices and relatively slow market penetration for natural gas, but it probably contributed to the relatively high growth of natural gas demand in the late 1960s and early 1970s.

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[3] This is in contrast with the recommendation on crude oil, that 'the export from Canada of crude oil be permitted under annual licence' (26). Since both exports are carried by pipeline, the difference in the conclusion must have hinged on the greater role of exports in natural gas production. However, if the reason for cutting gas exports were to service domestic markets, shorter-term export contracts should not have adversely affected the ability to finance at least the main Canadian components of the pipeline system.

In the thirteen years following 1958 the National Energy Board was established (in 1960) according to the Borden commission's recommendations and proceeded to issue gas export licences on a case-by-case basis. By the end of 1971 total export sales had cumulated to almost 6 trillion cubic feet (tcf), and future export commitments (on contracts expiring mainly in the late 1980s) were approximately 17 tcf. The latter total was reached when big new export approvals in 1970 added more than 6 tcf to existing export commitments, helping to set the stage for the mid-1970s, when there was a widely shared industry and government perception that domestic demand and committed exports had already exceeded, or would soon exceed, the available supply from non-frontier sources.

The mid-1970s regret and recriminations about past export commitments had several causes and several aspects. I have analysed the events elsewhere in some detail[4], so only a brief summary need be given here. In the simplest terms, the low prices of the early 1970s led to fast demand growth and a slackening pace of new supply additions. When world oil prices shot up in 1973-4, and there was a scramble for the current and potential windfall gains on low-cost natural gas deposits, it became apparent to many producers that it was more profitable to keep reserves in the ground than to invest in facilities that would permit faster production. This genuine element of supplier reticence was increased by uncertainty about the tax and royalty structure, by the continuing efforts of TransCanada PipeLines to use its monopsonist position to hold down wellhead prices in Alberta, and by physical deliverability problems in two major BC fields. These conditions of tightening short-term supply were exaggerated by those who were anxious to show Canadian need for Mackenzie Delta gas, or to make use of a perceived shortage as a lever to establish a more favourable tax and royalty climate.

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[4] See Helliwell (1975) for an analysis of the NEB's crucial 1974-5 gas supply and demand hearings, Helliwell (1977) for further evidence on the links between the domestic supply and demand situations and the frontier development proposals, and Helliwell (1979, 199-209) for a

In this artificial climate of natural gas shortage there were many recriminations against the NEB for accepting so many new long-term export commitments in 1970. There were also complaints, less widely heard, that the NEB had acted far too slowly in raising the natural gas export prices to match the value of new sources of competing fuels in export markets. In the event, the initiative on export prices came from the governments of British Columbia and Alberta.[5]

The established industry and NEB view that there was a shortage lasted as long as there were active Mackenzie Valley Pipeline proposals dependent on the proponents' ability to show such a need. Even as late as mid-1977, despite the increasing number of willing producers without markets, creating the so-called 'gas bubble,' the three main producer proponents of the Mackenzie Valley Pipeline were arguing that, 'there could be deliverability problems during peak demand periods as early as 1980 and an over-all gas supply shortfall by 1982 or 1983.... If the discovery rate for new reserves fails to live up to expectations or some of the presently connected pools fail to perform as expected, the shortage problem will present itself even earlier and in a more acute form.' ('Final argument Submitted on Behalf of Gulf Oil Canada, Imperial Oil and Shell Canada, to the NEB Northern Pipeline Hearings,' June 1977, 5-6).

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retrospective survey. Kierans (1974) recounts the arguments used in cabinet when the 1970 expansion of exports was approved. Very similar arguments were made during the 1979 NEB export hearings.

[5] The mechanisms used are described in Helliwell (1979, 188-9).

By this time some other natural gas producers were realizing that the strategy of using shortage to justify a Mackenzie Valley Pipeline would be likely to backfire, destroying the credibility of industry projections and making new export permits politically impossible to obtain. From this point of view, the NEB's selection of the Alaska Highway Pipeline over the Mackenzie Valley proposals provided a partial political solution, because the Alaska Highway proposal did not require the use of Canadian gas and was not dependent on the demonstration that frontier gas would soon be needed for domestic use.

Even so, the general public has probably reacted with a mixture of puzzlement and cynicism to the current batch of export applications, totally about 10 tcf, which would represent, if all were approved, an approximate doubling of the remaining quantity of committed exports.

Before turning to the issues surrounding these proposed export expansions, are there any lessons to be drawn from the earlier experience? In retrospect, and in light of possible changes in circumstances, it was probably unnecessary and imprudent to make export contracts for such long terms, especially when, as in 1970, the main transmission facilities were already in place. Second, the experience shows that some form of export price regulation seemed to be necessary to obtain full value for gas exports, at least during those periods when new high-priced contracts could not come into force to trigger the contract clauses that would have raised other prices to match. The experience with the early contracts between Westcoast and its export customers and the mid-1970s buying practices of TransCanada PipeLines in Alberta illustrate monopsony that can only be offset by countervailing powers at the provincial or national levels.

Third, the substantial swings in industry and regulatory views about current and future demand, supplies, and costs of natural gas suggest that the arbitrary calculations used to protect future Canadian users contain a large subjective element. To some analysts this is a good thing, since it permits constructive imagination to be used instead of expensive labour and capital in establishing proven reserves far in advance of the required date of production. To others the unsubstantiated swings in opinion that supported new exports in 1970, new frontier sources for domestic use between 1973 and 1977, and major new exports in 1979 destroy the credibility not only of the formulas used to protect future Canadian consumers but also of the producers' arguments and of the government agencies established to hear their evidence.

Finally, as a prelude to considering the current export proposals, it is worth noting that the price deemed just and reasonable for Canada's natural gas exports in early 1974 (33¢/mcf) is one-tenth of the export price in effect since 11 August 1979 ($2.80 US/mcf - equivalent to $3.30 Can. if $0.85 US = $1.00 Can.). Even after an allowance is made for general inflation, whether measured by the Consumer Price Index, the GNP deflator, or the price of Canada's imports (including imported oil), the real rate of increase in the gas export price has been more than 35 per cent a year compounded annually. If the gas exported in 1972 and 1973 just under the new licences issued in 1970 were sold at today's prices rather than the actual prices it would be worth almost $3 billion instead of the less than $300 million actually obtained. In the dazzling clarity of hindsight that gas would much better have been left in the ground. In terms of btu equivalence with Canadian light crude exports, today's prices of about $30 Can. a barrel[6] the export value of the gas sold at 33¢/mcf should now be $5/mcf.

The 1979 export proposals

In July and August 1979 the NEB held export hearings involving a variety of new export proposals, almost 0.8 tcf per year, an expansion of about 80 per cent on the current flow of approved exports. The total amount of gas covered by the applications is about 10 tcf,[7] compared with end-1979 export commitments of about 10 tcf on existing export contracts.

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[6] This was the export price of Canadian light crudes in August 1979, comprising a wellhead price of $13.75, an export levy of $15/barrel, and transport charges of about $1.25/barrel. The light oil export price was $31/barrel in September. The average price of crude oil imported to Canada in July 1979 was apparently about $26. The difference between the import and export prices reflects a quality differential of about $2/barrel (Canadian imports have an average specific gravity of about 31°API, while our light crude exports range from 35° to 38°API) and probably some low cost sources and lags in contracts and shipping on the import side. Further discussion of crude oil prices is contained in the notes to Table 2.

[7] The exact size of the proposals is difficult to measure, as some of the applications have been partially amended during the course of the hearings and the total of requested annual export flows is in some cases greater than the total term volume of exports for which approval is requested. The requested annual flows between 1980 and 1995 total 10.2 tcf, of which 5.6 tcf is the Pan-Alberta prebuild proposal, 0.77 is the ProGas export proposal, 0.65 tcf is near-term licence extensions (by Westcoast and TransCanada) from 1980 to 1985, 2.2 tcf is far-term licence extensions (chiefly by Westcoast and by Alberta

By far the biggest application is by Pan-Alberta Gas, to export 0.38 tcf/year for up to fifteen years, with firm approval requested for the first seven years and either conditional or firm approval requested for the rest. The split between conditional and unconditional export approvals reflects the new NEB export policy laid out in the February 1979 gas report. The export approvals at the beginning of the decade were for long fixed terms and depended on the existence of adequate reserves under contract to cover the export contract plus the applicant's ability to show that total Canadian proven reserves were sufficient to cover all export commitments plus twenty-five times estimated Canadian demand four years ahead. The new policy differs from the old one in significant respects. First, explicit account is now taken of expected future deliverability by means of two types of test. The current deliverability test requires that production from existing established reserves be adequate to cover forecast domestic demand plus authorized exports for a minimum of five years into the future. The future deliverability test requires that expected deliverability extend to ten years or more but allows estimated future reserve additions to be used when forecasting deliverability. Finally, there is a straight reserves test, requiring established reserves to equal twenty-five times the current level of Canadian demand plus authorized exports.

If the reserves test and both deliverability tests can be passed on the basis only of currently established reserves, the NEB may issue a firm export licence. To the extent that future reserve additions are relied upon when meeting the future deliverability test, the NEB will provide a conditional approval that can subsequently be rescinded or reduced if actual domestic demand growth is higher than forecast or if actual reserve additions are smalller than forecast.

The net effect of the changes in NEB export criteria is to reduce the amount of reserves that have to be established while decreasing substantially the likely term of firm export contracts. This should reduce the waste involved in establishing wellhead production capacity long before production is required and decrease the risk that supply or demand surprises (or self-serving forecasts) could cause supply shortages for Canadian gas users.

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and Southern) between 1986 and 1995, and the remaining 1.0 tcf represents five smaller applications.

Without restricting its own subsequent freedom of judgment or the pending export applications, the NEB gas report of February 1979 included example calculations that suggested about 2 tcf would be available, under its new tests, for new export applications spreading over five to eight years. However, since that time the Alberta Energy Resources Conservation Board (AERCB) has lowered its own period for Alberta production from thirty to twenty-five years, thus increasing the NEB's probable estimate of surplus, because the latter's calculations take account of amounts reserved by Alberta for its own requirements.[8] In addition, most of the producers and the AERCB have increased their estimates of reserve additions and deliverability, and the NEB is likely to follow suit. Thus it would not be surprising if the NEB now were to conclude that there were 4 to 5 tcf of reserves available for export permits with perhaps half of that on a firm basis.

Because it is unlikely that the NEB will alter its new tests before they have been applied, and because there are limits to how much 'new' evidence can be said to have appeared in six months, the Board is unlikely to approve much more than half of the additional export flows requested. The key issue is how the Board will or should deal with the request to dedicate 5 tcf or more of Canadian gas to support the pre-building of the southern legs of the Alaska Highway system. Some participants at the hearing have argued that the term of the Pan-Alberta permit be limited to five year (and hence the pre-build export total to 1.9 tcf) lest US customers be tempted to defer building the rest of the line to Alaska. Pan-Alberta on the other hand argues that a longer term is required to insure the financiers of the southern legs against the possibility that the Alaska gas is never connected for delivery. A third view is represented by a rival group of gas producers[9] arguing that the use of Canadian gas to support pre-building of the Alaska Highway pipeline simply benefits the Alaskan producers (and eventually US consumers of Alaskan gas) at the expense of Alberta producers. This cross-subsidy arises from the unconventional tariff formula that overcharges early users relative to later users of a pipeline system, and hence inclines short-term exporters to hitch a ride on existing pipelines rather than be the first users of a new facility.

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[8] British Columbia, the other main gas-producing province, has no formal procedure for protecting its own requirements, although the government does sometimes appear in the NEB hearings. In the current hearings the BC government is supporting Westcoast Transmission's bid to have its export authorization raised by 8 per cent to about 0.3 tcf/year and extended to 1995.

[9] The ProGas consortium, represented, ironically enough, by the ex-president of Canadian Arctic Gas Pipeline Ltd. (CAGPL) lost its bid for a Mackenzie Valley pipeline partly through its inability to argue convincingly that frontier gas was needed urgently to meet Canadian demands.

No discussion of the export possibilities would be complete without some discussion of demand conditions. From a national point of view the setting of export quantities and export prices cannot be done independently, although the present procedures split the two elements in a way that hides the essential interdependence of prices and quantities. The current procedure is to set export maxima in the first instance, with prices then subsequently set, at least in principle, so that the purchasers are indifferent between the imported gas and their next best alternatives.[10] In the past the NEB tended to keep export prices low enough that there was still excess demand at the permitted export maxima. The current export price of $2.80 US and the likely end-of-year price of $3.30 US are 65 per cent and 75 per cent of the btu-equivalent prices of Canadian light crude exports to the United States.[11]

Although the Canadian natural gas export price is, and is likely to remain, below the btu-equivalent price of US oil imports, both prices have risen dramatically in the past year or two, in a way that is likely to spawn new energy-conserving efforts, accompanied in all likelihood by a slackening in United States GNP growth. In addition, US natural gas prices are being progressively deregulated, thus reducing the extent to which U.S. users can be cushioned from the high costs of imported gas by having its cost 'rolled-in' with the costs of US gas. All of this will increase domestic US supplies of natural gas and decrease US demands. However, in this post-Iran period of world oil uncertainty, it is likely that US policy, like Canadian policy, will encourage the use of US (or Canadian) gas instead of imported oil.

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[10] In practice the export price recommendations now made by the NEB are apparently based on the price of Canadian oil imports.

[11] In Canada the Toronto City Gate price of natural gas is about 85 per cent of the btu-equivalent price of Canadian crude oil delivered to Toronto. Past federal policy has been to remove this price preference for natural gas, but increasing domestic gas supplies and tighter world oil markets are likely to tilt this policy towards maintaining the discount and even deepening it in markets where Canadian gas might be substituted for imported oil.

In the meantime, however, there is some uncertainty about the potential export demand for Canadian gas. One export applicant, albeit a small one, withdrew its application in the light of demand uncertainty, and the main US purchaser of BC gas, who was relieved of the contract's 'take-or-pay' provisions when there were shortfalls in BC deliveries, has been using BC gas for winter peaks and taking far less than the permitted amounts during the summer months. From the Canadian point of view it is important to choose the combination of export quantities and prices that is consistent with the realities of the export market and maximizes the present value of net Canadian benefits from the export sale. In principle this calculation might not produce a uniform price for all Canadian gas exports, because the alternatives to Canadian gas differ from region to region in the United States. The various cost/benefit studies submitted by participants at the 1979 gas export hearings do not fully account for demand conditions, presumably relying on the assumption that the combination of export price and permitted exports will be such that there is an excess demand for gas exports. But from the national point of view this is not the right way to approach export policy, since under excess demand conditions a higher export price would unequivocally increase net Canadian benefits.

Given the uncertainty about the feasible combination of export prices and volumes that would be consistent both with US demand conditions and with assured future supply for Canadian users, it is difficult to estimate the revenue possibilities from export sales. Nevertheless, some example calculations may be useful to give some impression of the magnitude of the export proposals. If the NEB were to approve 0.5 tcf/year for five years, and if the gas were priced at $4.00/mcf (equal to the new export price of $3.45 US at $0.86 US = $1.00 Can.), the annual addition to export revenues would be $2 billion, equivalent to almost 1 per cent of GNP, or almost one-third of Canada's likely current account deficit for 1979. At the btu-equivalent price of $5/mcf, 0.5 tcf/year would produce $2.5 billion a year in export revenues, and the pre-build export volumes alone would produce almost $2 billion a year. This would not be the whole of the direct effect on the current account, however, because a substantial portion of the revenues would flow back to the credit of the foreign shareholders of the gas-producing firms on either a current or deferred basis.[12]

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[12] The links between the profits of foreign-owned firms and the current

In any event, the proposed export sales are large enough, and potentially lumpy enough, to have a major impact not only on the measured current account deficit but also on exchange rate expectations, on the current value of the exchange rate, and on the prices and profits of importers, import-competitors, and other exporters.

Alternative domestic uses

One of the emerging issues in current Canadian energy policy is the best method of insulating Canada from some of the current price and availability uncertainties of the world oil market. In the absence of these uncertainties, which have in most observers' opinions grown over the past year, there would be no reason to link natural gas export policy to oil import policy. If both products were sold at world prices, then with some qualifications based on foreign ownership, on the nature of the tax and royalty system, and on the non-renewable nature of low-cost oil and gas deposits, the maximum advantage of Canadian energy resources would be obtained if surplus natural gas were exported and oil deficits covered by oil imports - if indeed that were the nature of the Canadian balance at world prices.

However, it is increasingly apparent that the stability of the world economy over the next decade will depend importantly on its ability to reduce demand for OPEC oil. Although the benefits of any one country's oil import reduction or increases in its oil import flexibility are shared amongst all oil importers, the benefits for individual countries from their own actions may be great enough to justify some investment in flexibility of supply and demand, even without the assurance of corresponding investments by other oil-importing countries. The rises in oil prices over the past year and their continuing unpredictability have increased the return on energy conservation, energy production from alternative sources, and the extension of distribution systems for other fuels. Hence it is nec-

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account of the balance payments are complicated in two ways. The Canadian statistics (unlike the Australian and the new US figures) include only dividends to foreigners in the service imports, while it would be more accurate to include all profits accruing to foreigners as an import of services with reinvested earnings shown as a capital inflow. Second, the very large tax incentives offered for reinvestment of oil and gas profits mean that book profits and current federal tax receipts are artificially low, with the firms acquiring net assets in the form of new oil and gas reserves and the federal and provincial governments acquiring deferred tax claims.

essary to reassess the various proposals for using additional natural gas in Canada before approval is given to any export commitments that might jeopardize preferred Canadian uses. I shall consider four principal types of incremental Canadian use, along with their implications for oil imports and natural gas exports.

1 Natural gas to eastern Quebec and and the Maritimes

There are two main schemes in play, the Q & M pipeline proposed by Alberta Gas Trunk Line and the TransCanada PipeLines plan to extend gas service eastwards to Quebec City and the Eastern Townships, to build distribution systems in some Maritime cities, initially fuelled by propane but with the option of later filling in the intervening transmission line if warranted by either eastward or westward flows. The Q & M proposal is essentially predicated on eastward flows of Alberta gas, with successively smaller transmission lines as the system approaches its Maritimes terminus. The TransCanada proposal is focused on the possibilities of production from natural gas deposits now being explored in the Sable Island area, and hence would imply transmission line sizes as suited to westward as to eastward flows between Quebec and the Maritimes. The major multinational gas producers with long purses and substantially connected western Canadian deposits are sceptical, especially of the Q & M proposal, because the likely Maritime gas demand volumes are not large enough to support a transmission system without a large explicit or implicit subsidy from either producers or governments. Unconnected producers, especially the smaller firms with more drilling prospects than borrowing power, are much more prepared to take on the incremental sales at a discount price, especially if (as suggested by Robert Blair of AGTL) the cost of the discount is shared among all producers by raising the pipeline tariff levied on all Alberta gas sold in all markets in Ontario and eastwards.

From a logistical point of view the TransCanada proposal has more flexibility, proceeding by stages each of which provides more information about the costs and benefits of the succeeding ones.[13] However, all the proposals for using gas in the Maritimes suffer from the same essential problem as the Vancouver Island proposal: the financial viability of the distribution system depends on obtaining large industrial sales to customers who would be more efficiently served by some combination of energy conservation and alternative energy sources.

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[13] The idea of using an attenuated or stretched-out project as a way of learning-by-doing has been advocated recently by Scott and Campbell (1979). Their analysis relates chiefly to the choice between attenuation and postponement of ways of mitigating the environmental and social impacts of large-scale resource projects in frontier areas, but it is equally applicable to projects that can be subdivided into a sequence of stages that can be revised or cancelled in the light of emerging information.

In any event, the earmarking of adequate western Canadian reserves to serve the eastern Canadian and Maritimes market is almost surely a prudent move for the NEB Even despite the possibilities that the project will not or should not proceed on the scale envisaged by Q & M and that sufficient gas should be discovered in the Sable Island area, the amount required to assure supply is substantial enough (estimated by the NEB to reach 160 bcf/year by 1995) that several tcf would have to be notionally put aside to cover these possibilities. It has been calculated that a subsidy of about 60¢/mcf (in 1979 prices) would be required to make natural gas sufficiently competitive with oil products to attain the market share for natural gas forecast by the NEB.

How do the economics of this compare with the economics of incremental exports? Assuming that the future real price of world oil were to remain at its present level, almost $30 in terms of 1979 Canadian dollars, then the btu-equivalent natural gas price would be $5/mcf. This suggests that export sales would be economically preferable to use in Quebec and the Maritimes only if their price exceeded $4.40/mcf ($5 less the 60¢ subsidy required for marketing in eastern Quebec and the Maritimes). There are some qualifications to be made. First, some of the energy sources that are alternative to natural gas in Quebec and the Maritimes (whether conservation, coal, residual fuel oil, or Quebec electricity) may have an opportunity value less than the $30/barrel price of world oil. Thus the required subsidy may be greater than 60¢/mcf because the projected gas sales volumes may not take due account of energy conservation possibilities, and the comparable export price may be less than $4.40. Second, it is likely that the largest part of the incremental market in Quebec would require only a fairly small subsidy, while the service to the Maritimes would have much higher unit costs. Third, the subsidy calculation may be predicated on the usual 'front-end loading' of pipeline tariff charges and hence be overstated, and it is probably appropriate to allow some premium for natural gas in terms of security of supply and the resulting ability of Quebec and the Maritimes to accommodate disruptions in world oil supplies.[14]

2 Natural gas to Vancouver Island

The basic idea of the proposal here is the same as for the Q & M proposal. However, the logistics are such that a substantial volume of sales would be needed to justify the underwater transmission line, and the only substantial users of fuel oil on Vancouver Island are the six large pulp and paper mills. At oil and gas prices far below world levels, even at current Canadian domestic prices, it is economically worthwhile for the mills to increase substantially their use of wood wastes as 'hog fuel' to replace fossil fuels and to cogenerate electricity. At world oil prices, additional forest residues become worth gathering to supplement normal mill supplies of wood wastes. Since the Vancouver Island pulp and paper mills should not, and probably would not, be major users of natural gas even if it were available, the costs of supplying natural gas to Vancouver Island become very great and the volumes so small that there is no longer any important link between the Vancouver Island proposal and the amount of gas that needs to be set aside to supply future Canadian needs.

3 Natural gas as a petrochemical feedstock

I have analysed elsewhere (Helliwell 1979, 216-19) the rather shaky economics of the so-called 'world-scale' petrochemical projects using Alberta natural gas. The key problem with these projects is that they take feedstock with a high value in alternative uses, already connected by pipelines to secure markets, and use a great deal of capital and a small amount of labour to convert the gas into petrochemicals for which the world markets are very cyclical and frequently in heavy excess supply. Some of the processes, especially the conversion of natural gas to methanol, are best regarded as converting natural gas to a form that is more easily transported and perhaps more easily passed through export barriers, if not through US anti-dumping levies. As such, they are likely to have their most economical application in those producing regions where the feedstock is far from market access and has a low opportunity cost. The Middle East, where much natural gas is now being flared off, provides a key example, but many other countries, ranging from New Zealand to Pakistan, have discovered gas reserves far from suitable markets and are contemplating gas-based petrochemical projects as a means of overcoming the high cost of shipping natural gas in its natural state. Within Canada petrochemical developments have been responsible for almost all the net growth that has taken place since 1976 in industrial sales of natural gas in Canada, and it is hard to imagine further expansions representing the best available use of the well-located low-cost gas deposits in Alberta. It is possible to conjecture that small scale plants may eventually be used to convert natural gas in minimal quantities to more easily transportable products in circumstances where gas deposits are too small and too far from existing markets to merit pipeline construction. In the longer term it is likely that the most profitable and secure basis for petrochemical expansion in Canada will involve the use of heavy oils, coal, and oil sands as feedstocks. Petrochemicals would be obtained as principal joint-/or by-products of the extraction and conversion of these energy forms, the Canadian supplies of which are hundreds of times greater than those of conventional natural gas. My hunch is that further petrochemical developments based on existing non-frontier natural gas deposits are not economically strong competitors against the alternatives posed by export markets, other domestic uses, or retention for the use of future generations.

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[14] It is worth noting, however, that temporary stoppages in imports of oil may be more efficiently and completely insured against by stockpiling Alberta oil (perhaps shipped 'under bond' on a marginal transport and pumping cost basis when there was unused wellhead and pipeline capacity) in underground storage rather than by installing a natural gas pipeline that relies for its economic justification on continuous use.

4 Increased use of natural gas in established market areas

The key mechanism employed in this strategy is that of relative prices. Gas distribution utilities have long known which were the price-sensitive users, and have used their rate structures to keep the high-volume price-sensitive industrial users. During the mid-1970s the situation altered somewhat in the face of escalating costs of gas supply, uncertainty about the extent and timing of new supplies, and the glut of heavy oil. The latter glut was caused by industrial slowdown coupled with rigid refinery structures incapable of shifting quickly to producing a higher proportion of motor fuels and a smaller proportion of residual fuels.

There are some currently industrial users close to the margin between fuel oil and natural gas, and in some regions of the country (parts of British Columbia and Quebec) the ability of natural gas to capture new residential heating is threatened by low-priced (but not low-cost) electricity.[15] In other parts of the country uncertainty about future oil supplies and the continued existence of relative price advantage of natural gas over furnace oil for most residential users have raised the prospect of widespread residential conversions from oil to natural gas.

The difficulty in domestic natural gas pricing policy is to find some mechanism that conserves natural gas for its best uses, while recognizing that the concept of 'best use' depends on the location and costs of alternative energy sources. The complete deregulation of natural gas prices, providing each potential producer the right to contract with a final user and to obtain the services of gathering, processing, transmission, and distribution on a common carrier basis, has been advocated. The objective would be to reduce oil use and to convert shut-in would-be producers into either producers or content investors in non-producing reserves. The mechanics of getting from here to there are by no means clear, given the present institutional structure whereby the gas utilities sell gas and distribution services as a package, with the over-all average rate of return subject to regulation. Easier to envisage is the possibility that the present system of federal regulation of the Toronto City Gate price would lapse, to be replaced by Alberta determination of an Alberta border price (just as there is federal determination of the border price of exports from Canada), with downstream utilities setting prices just as they did prior to 1974. Even more likely is that the federal government would in the short term provide some continued discount on a btu basis, perhaps even larger than the 15 per cent now applying at the Toronto City Gate.

The problem with using an explicit policy of price discounting for natural gas as a means of cutting oil use is that the primary effect is to increase total energy consumption, with the consumption of natural gas being increased far more than the consumption of crude oil is decreased.

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[15] Inland Natural Gas (1978) reports that in the part of its service area supplied with electricity by West Kootenay Power and Light, at a residential price of 1.1¢/kWh, half of the new residential construction uses electricity rather than gas for central heating. Their own average 1979 rate for residential gas is $2.23/mcf. These two prices provide more or less equivalent heating bills for the residential user. If electricity were priced at its marginal cost in British Columbia, more than 2.5¢/kWh in terms of 1979 prices, and if gas were sold at its current export value, the residential customer would have a clearer preference for natural gas for space heating, and both forms of energy would be used more efficiently.

The waste involved in this strategy becomes even greater if the domestic price is pushed significantly below the price available in export markets. However, as shown in Helliwell (1979, 197-8) and in my comments on Tom Powrie's paper in this volume, the fact that lower domestic prices are paid principally by Canadians, while the after-tax profits from higher-priced sales fall three-quarters to foreigners, means that in some circumstances the distributional effects can more than offset the costs of wasteful use as seen from the point of view of Canadians.

The waste from underpricing is especially great in the producing provinces, where gas is sold to provincial users at a price far below the export price. In British Columbia, for example, the wholesale price of $1.17/mcf is less than 30 per cent of the November 1979 export price. This leads to such anomalies as the use of natural gas to dry coking coal before export, even though the firms could apparently save money by using their own coal at prices above $1.60/mcf, less than 40 per cent of the November 1979 gas export price.[16] Similar waste arises in the use of natural gas to generate steam in pulp and paper mills that could and should be making greater use of their own wood wastes. A second problem with using discount pricing to encourage more domestic use is that the key competition in the industrial market comes from residual oil, and the result could be to worsen the current problems of relative excess supply of that product.

The above discussion suggests that the market pressures of temporarily surplus gas, the policy goal of cutting oil use, and distributional goals are all likely to favour the use of discount prices to increase gas use in traditional markets. However, the over-all policies of moving towards world prices and of using energy efficiently are likely to restrict the scope of the discount (except in the possible new market areas discussed earlier) and hence the volume of extra gas required.

Gas supply and costs

Perhaps the most important, and certainly the most uncertain, element in the formation of a rational gas export policy is the cost curve for the discovery and production of additional services of non-frontier natural gas.

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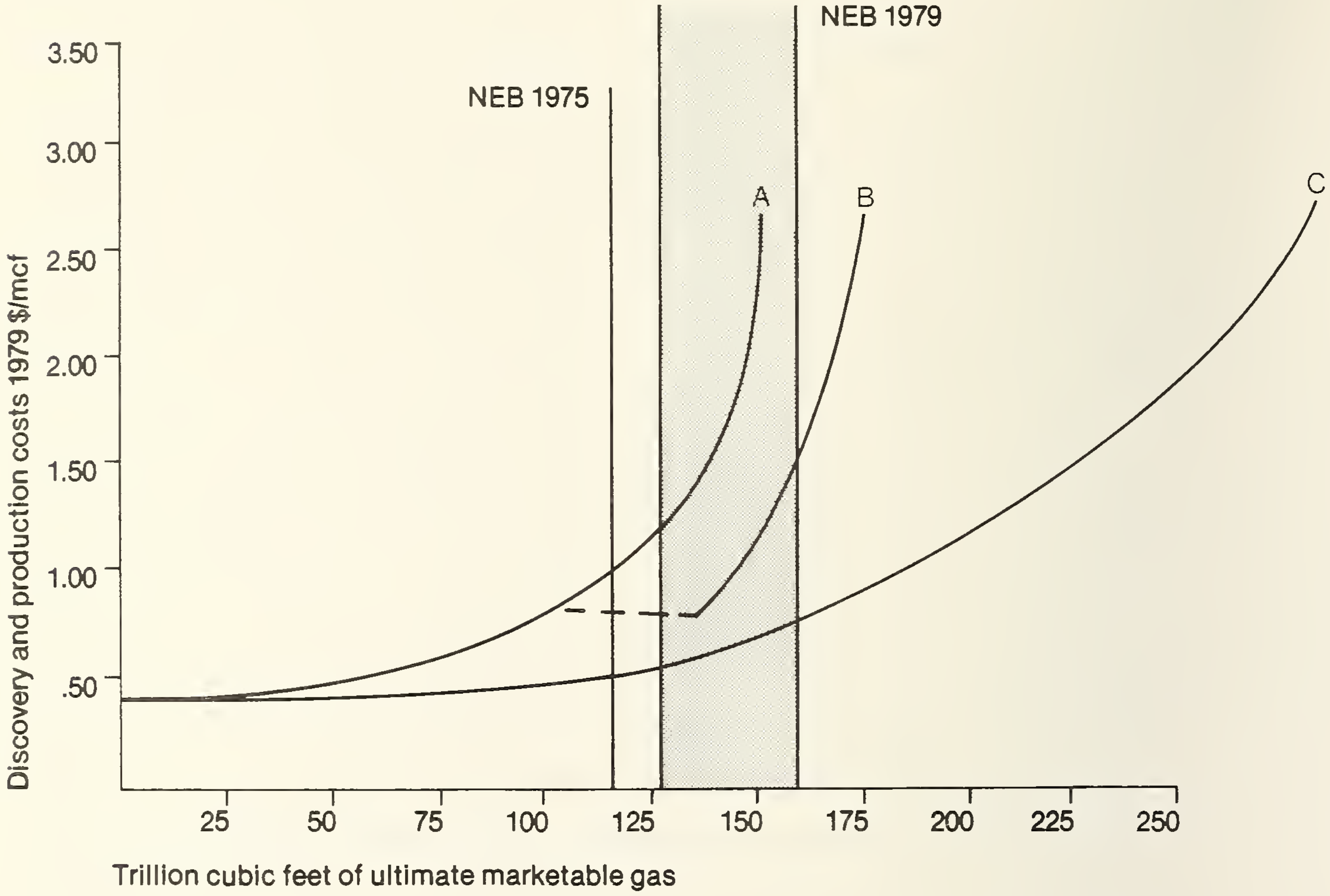
[16] This reflects the fact that the export price of coking coal, per effective btu, is far less than that of natural gas. In addition, of course, the coal is already at the site (see Canadian Resourcecon, 1978, 86).

Whether the NEB's deliverability and reserve tests can be passed depends primarily on the fairly well-understood properties of established reserves, with some additional information required in the case of conditional export approvals about reserve additions over the following few years. But the decision about whether exports should be expanded at all and about the reservation prices that should be set for export contracts depends on the much less well-understood cost conditions for exploration and production of natural gas and of substitute fuels over a much longer horizon.

The extent to which expanded domestic use and additional exports should be regarded as competing uses for the available quantity of uncontracted exports depends crucially on the extent to which exploration and production costs are likely to rise in real terms in the future. If the cost curve, measuring full cycle costs per mcf against the quantity of reserves discovered, is fairly flat over an extended range of reserve additions, there is less competition between exports and expanded (or future) domestic use. In Figure 1 and curves A and C show two possibilities, curve A representing a view consistent with that in the NEB February 1979 report, and curve C representing a view consistent with that of Canadian Hunter, the firm that originated the research and exploration drilling in the Elmworth and Wapiti fields and elsewhere in the so-called Deep Basin of northern Alberta and British Columbia. The vertical line at 115 tcf shows the estimate of ultimate non-frontier reserves made by the NEB in 1974-5. The shaded vertical area represents the probability range of ultimate reserve estimates made by the NEB in its February 1979 Report. Neither of the two NEB reports made any explicit estimates of the price-responsiveness of the ultimate stock of economically recoverable reserves, but curve A is consistent with the wellhead price assumptions in the 1979 report. It is also consistent with the cost curve assumed in the calculations of costs and benefits reported below in Table 2.

Curve B shows what happens to costs if there is an exogenous, or perhaps time-dependent, technical advance that increases the total quantity of recoverable reserves for any given expenditure. What is the link between this kind of technical progress and the rate of development for export? In general the higher the rate of such exogenous or time-dependent technical progress, the more it pays to defer development, so as to reduce the proportion of reserves developed with square wheels. Therefore it is important to distinguish between technical advances that are

FIGURE 1: Alternative cost and supply curves for Canadian non-frontier natural gas

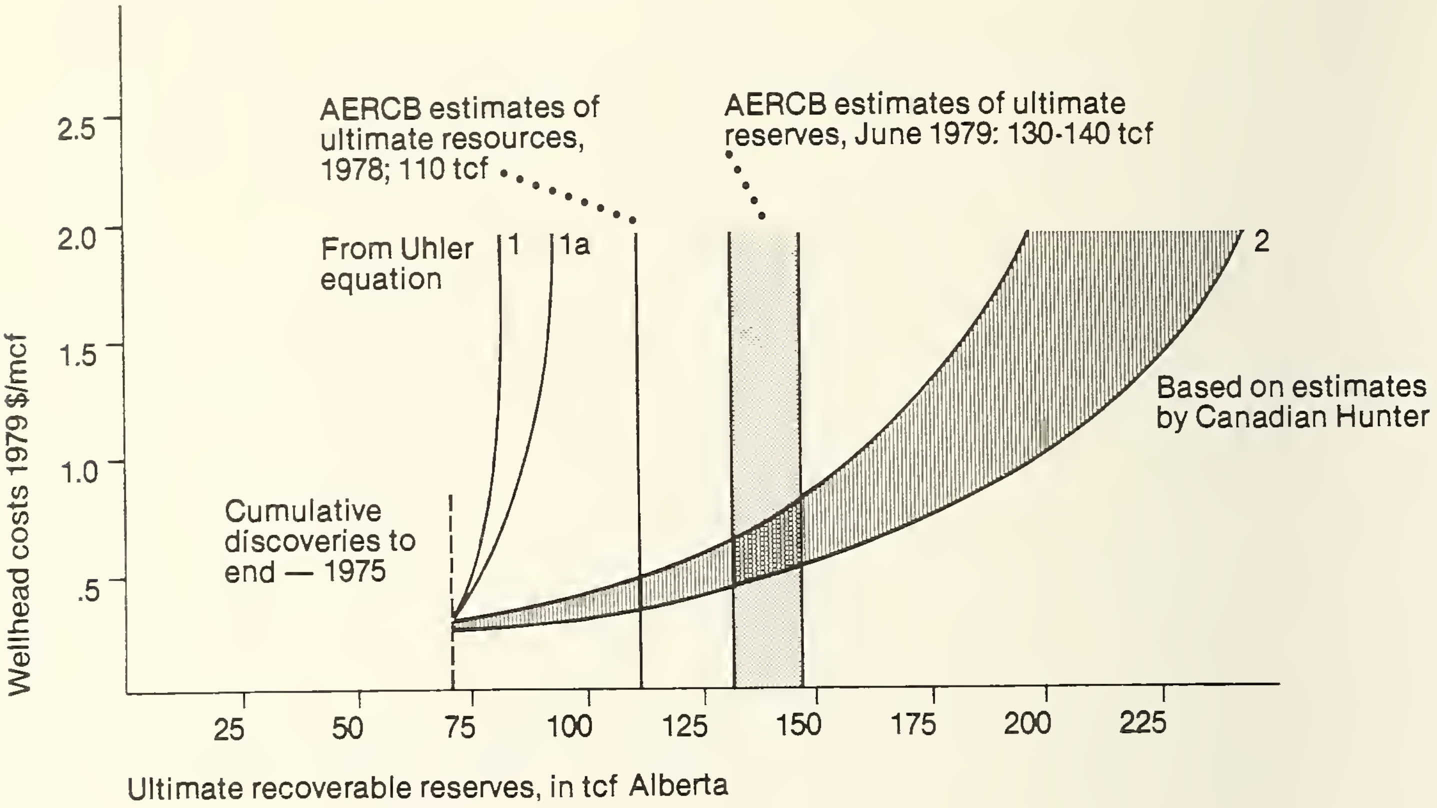


closely related to scientific developments in general (or to drilling technology in other countries) and those that are always available in principle but only brought to use when the wellhead price gets high enough to justify the expense.

The relevance of this point is especially great in the present Canadian context, where a large portion of the ultimate reserves indicated by curve C in Figure 1 is dependent on the application of emerging technologies that make it possible at reasonable cost to tap gas formations of low porosity. If these technologies are now fully available and require only implementation, and if curve C or something like it is an accurate representation then a fairly open export policy would have a low opportunity cost from the viewpoint of future Canadian gas users. If the technology is still nascent, however, the situation becomes more complicated. If the technical progress required is partly of the learning-by-doing type, the higher costs imposed by early development may be partially offset by building up the expertise that may itself be saleable elsewhere. If the technical improvements depend on time at the drawing board and in experimental situations at home and abroad, the producers and leaseholders may be better off biding their time than pushing for fast development of export markets.

What is the evidence to support or reject the type of cost curve shown by curve C in Figure 1? In its support are the impressive drilling results and land price bids that the Deep Basin and other promising areas have generated. On the other hand the data on drilling effort and results between 1950 and 1975 may be interpreted in a much more pessimistic light. In a recent study of oil and gas finding costs, Uhler (1979) estimated reserve discovery equations where the amount discovered depends on the quantities of exploratory inputs and on linear and quadractic terms containing the cumulated stock of reserves. The effect of his quadratic specification, when applied to total Alberta data, is to give the cost curve (using reserve discoveries cumulated to 1995) showns as curves 1 and 1a in Figure 2. The implied ultimate stock of reserves at any cost is well below either the NEB 1979 or the AERCB estimates of the ultimate stock of economically recoverable gas reserves in Alberta, and much farther below the Alberta estimates implied by the Canadian Hunter curve C in Figure 1. Uhler tried including a wellhead price directly in his equation but found no significant effect during his estimation period, which ended in 1975. Extending his data period would progressively change his results, because the type of reserve additions implied by the Canadian Hunter cost estimates have begun to show up as annual reserve additions of 5 to 6 tcf/year in the late 1970s. Similar potential future additions must also exist in the expectations of those firms now paying record prices in almost every sale of drilling rights in British Columbia and Alberta. The drilling statistics clearly demonstrate some price responsiveness of reserve additions. From the point of view of export policy, the key question is how long the higher rate of reserve additions will be maintained. Are the newly economic reserves being converted quickly to proven reserves, or have we seen only the top of the iceberg?

FIGURE 2: Alternative views of Alberta gas reserves recoverable at different costs



NOTE: The costs used in the Uhler equation are finding costs, including land costs. To be fully consistent with the notion of economic costs, land costs should be excluded (because they depend principally on the surplus of expected wellhead prices over costs, and not on alternative uses of the land) and production and processing costs should be included. If the former effect should exceed the latter, curve 1 should be shifted down, and vice versa. The curve is so steep in any case that such a shift cannot have much influence on the derived estimate of ultimate recoverable reserves.

Curve 1 is obtained by using Uhler's estimated equation 4.7 to forecast discoveries between 1976 and 1995 under alternative levels (and hence total costs) of exploratory inputs. Curve 1a is obtained by refitting his equation 4.7 to historical data revised to provide some rough accounting for reserve data not otherwise allocated to discovery wells. A more refined revision of his data is likely to produce a curve partway between curves 1 and 1a. At a marginal finding cost of $4 per mcf, his estimates of ultimate Alberta recoverable resources are 89 tcf using curve 1 and 97 tcf using Curve 1a.

Curve 2 is shown as a band to reflect the considerable uncertainty in the Canadian Hunter estimates. I am grateful for the assistance of Russell Uhler and Jim Gray in the construction of curves 1 and 2.

Perhaps it would be useful to explain the price-elastic cost curve for ultimate reserves. Curve 1 in Figure 3 shows a commonly hypothesized lognormal distribution of pool sizes against frequency. The frequency shows the number of pools of any given size worth developing under given technology and prices. The vertical line near the left-hand side of the distribution is a truncation line marking the minimum pool size worth developing under the given technology and prices. It is quite commonly understood that an increase in the wellhead price will cause a leftward shift in the truncation line as it becomes worthwhile dealing with smaller pools. However, it is implicit in the optimistic position about future supply that the effects of shifting the truncation line on the given distribution are likely to be much smaller than those following from an upward shift in the whole distribution, because there are more pools of all sizes that are worth developing.[17] Nor is there any reason to suppose that the properly defined distribution of frequency pool sizes is lognormal either before or after the price-determined shift, because the sources of the additional gas are varied - deeper formations, less porous formations, more complicated formations, sour gas, and so on - and each of the incremental sources of gas will have its own distribution of pool sizes that become economic at any given price.

What should be concluded from this survey of the uncertainty surrounding the costs and quantities of future reserve additions of natural gas? First, it is clear that the substantial difference in estimates of ultimate reserves recoverable at various costs reflects not just the difference of viewpoint between would-be conservers and would-be producers for export sale but also genuine lack of information about the size and number of gas deposits that are likely to be worth developing at the higher wellhead values now or later. Coupled with this is a substantial, although probably lesser, uncertainty about the form and extent of technical progress that could lower the real costs of developing some of the more difficult formations, especially those of low porosity.

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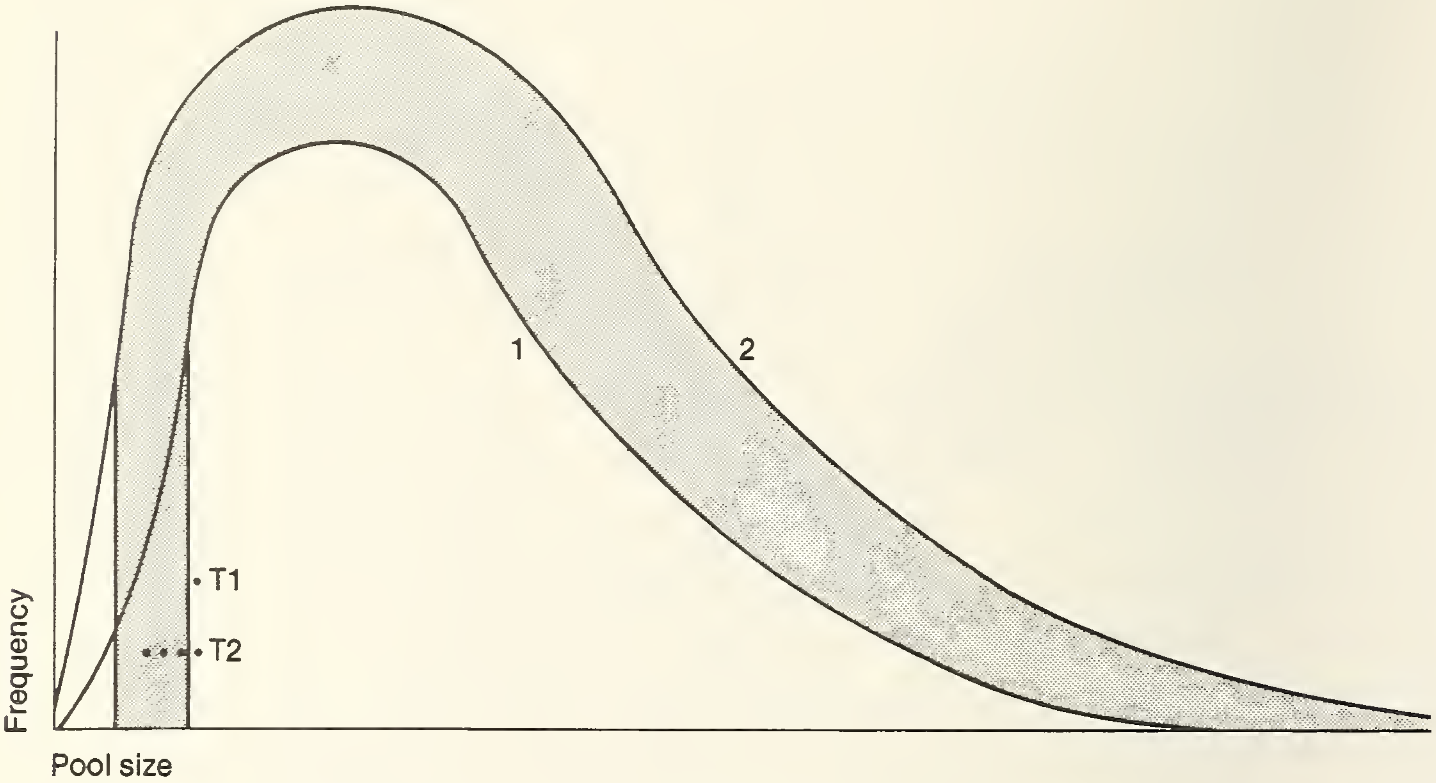
[17] In addition, the size of any given pool, whether or not it is worth developing at all at a given price, is likely to become larger at higher prices. This is because the pool size is, in terms of initial marketable reserves, equal to initial reserves in place times a recovery factor. Higher wellhead prices increase the range of economically advantageous recovery techniques, and hence raise the likely recovery rate. This impact is generally much more important for oil than for gas, because gas recovery rates are typically above 0.7 for gas even at low wellhead prices.

FIGURE 3: Frequency of economically recoverable gas pools under different price and cost conditions



NOTE: T1 marks the smallest pool that is worth developing at given initial wellhead prices, costs, and technology. When wellhead prices rise, or there are cost-reducing technological improvements, the entire distribution of pool sizes shifts up, as shown by curve 2, and the truncation line shifts left to include smaller pool sizes. The shaded area shows all the pools that have become potential reserves under the presumed improvement in the relation between wellhead prices and extraction costs.

Second, the uncertainty about the extent and cost of future reserve additions suggests an export policy that is flexible, has a high reservation price, and is deliberately conservative about future prospects so as to minimize regret and recriminations if history should unfold to match the Uhler equations more closely than the Canadian Hunter supply curve.[18] For what it is worth, my hunch is that the cumulative cost curve will turn out to be closer to curve 2 than curve 1 or 1A in Figure 2.

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[18] It is worth noting the link between this issue and the question of taxes and royalties. If the Uhler cost function is the appropriate one, all the windfall gains can be taxed away without serious impacts on future supply. If the Canadian Hunter curve is closer to the mark, the tax and royalty system must leave more on the table, at least for new gas, to bring forth the large quantity of potential supplies.

Analysis of costs and benefits

It is possible to do standard analysis of the costs and benefits of incremental exports once one is prepared to adopt specific equations for energy demand, interfuel substitution, costs of incremental exploration and production, the operation of tax and royalty systems, and the behaviour of exploration and development firms. Also important are the assumptions used about the opportunity cost of investment capital, world oil prices, the rate of social time preference, and the possibility of terms-of-trade effects. In the context of the current export decisions and the current state of available data and equations, the biggest uncertainties exist with respect to (a) the level and rate of change of future world oil prices, (b) the conditional demand schedule of the export markets, i.e. the quantities demanded (in various years) at different reservation prices for exports, (c) the marginal value of alternative domestic uses, and (d) the cost conditions for new discoveries and production of natural gas and substitute fuels. In addition, there is a tendency for standard models, which do not embody adjustment costs, learning-by-doing, or payoffs to diversification under conditions of uncertainty, to show a preference for lumpy export strategies, with the size and timing of the lumps dependent on the expected rates of growth of future costs and prices, on the tax, royalty, and pricing mechanisms used to distribute the costs and benefits, and on the discount rates used to compute the present values.

Table 2 shows some illustrative results obtained by using an integrated energy model developed at the University of British Columbia over the past several years.[19] The notes to the table record the assumptions for the base case and for the subsequent cases 2 to 6. There are two lines in each case, the first showing the net economic rents with export flows based on existing approved contracts and the second showing rents if production flows are accelerated by adding 5 tcf to exports. To model this, export flows under existing contracts are increased by one-half of the amounts requested in the 1979 export applications.

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[19] The structure and earlier uses of the model are described in Helliwell et al. (1979).

TABLE 2

Net economic rents from Canadian natural gas under various assumptions about export volumes, energy prices, and discount rates (billions of end-1980 Canadian dollars)

	Total rent (1)	All producers (2)	Canadian consumers (3)	After (waste of) (4)	Federal government (5)	Provincial government (6)	U.S. Consumers (waste not subtracted) (7)	Total Canadian rents (8)
Base Case								
with existing export contracts	181	20	42	18	26	73	19	145
plus 5 tcf new exports	195	25	42	17	29	77	23	153
Case 2 - Higher export prices								
with existing export contracts	181	23	42	18	28	76	11	152
plus 5 tcf new exports	195	28	42	17	31	83	11	162
Case 3 - Lower domestic gas prices								
with existing export contracts	191	14	72	36	21	64	19	160
plus 5 tcf new exports	205	18	72	35	24	68	23	168
Case 4 - Lower domestic gas prices and lower discount rate								
with existing export contracts	516	58	258	99	54	127	18	453
plus 5 tcf new exports	526	61	257	96	56	129	23	455
Case 5 - Lower domestic gas prices, lower discount rate, and higher replacement cost								
with existing export contracts	327	58	70	288	54	127	18	264
plus 5 tcf new exports	326	61	57	296	56	129	23	255
Case 6 - Real world oil price drops 2% annually after 1980								
with existing export contracts	125	4	35	15	15	53	18	104
plus 5 tcf new exports	137	8	34	15	17	57	21	110

NOTE: All economic rents are measured as present values of all past and future costs and returns, measured at the end of 1980 in terms of end-1980 prices.

Base Case Assumptions

(i) World oil price equal to $29.25 per barrel ($25US) in 1980, rising thereafter at 2 per cent a year in real terms. This is less than Canada's export price of $31/barrel in September 1979 for light crude oil, and less than late-September spot prices of $33-35US/barrel. It is approximately equal to the OPEC ceiling prices of $23.50US plus tanker and pipeline charges to Montreal.

(ii) Natural gas for domestic users (at the Toronto City Gate) priced at 85 per cent of btu equivalence with domestic crude oil delivered to Toronto. Prices elsewhere reflect differences in transport costs and lower prices to BC and Alberta users. In all cases the natural gas prices gradually move towards 100 per cent of btu parity as the time approaches when Canadian demands are expected to exceed supply from non-frontier sources.

(iii) Natural gas for export sale priced at 80 per cent of btu equivalence with world crude oil, less costs of delivering natural gas from the Canadian border to Chicago. This price is calculated to be $3.83Can./mcf, or $3.27US/mcf in 1980 and to rise thereafter at 8 per cent in nominal terms. This 1980 price is about 5 per cent less than the $3.45US/mcf price announced on 4 October 1979, to apply from exports starting 4 November 1979. It is 10 per cent less than the $3.62US/mcf price announced for sales of Mexican gas to the United States.

(iv) The general rate of inflation is assumed to be 7.5 per cent in 1980 and 6 per cent thereafter.

(v) The nominal discount rate used is equal to the assumed rate of general inflation (the actual rate is used prior to 1980) plus 7.44 per cent. The latter figure, which is a calculated average real alternative supply price of capital to Canadian business, is also used as the after-tax opportunity cost on invested capital when calculating net economic rents to producers. Economic rents to governments are net of an income tax opportunity cost equal to 3 per cent of capital invested. Total rents to the resource are net of a real capital rental charge equal to 7.44 per cent + 3 per cent = 10.44 per cent of undepreciated capital.

(v) Domestic wellhead crude oil price raised by $4 per barrel in 1980, 1981, and 1983, then by $5 a barrel a year until equality with world prices is achieved. Under the base case assumptions for world oil prices this occurs in 1985.

(vii) Ultimate non-frontier recoverable natural gas is assumed to reach 146 tcf, following the NEB gas report of February 1979.

Meaning of columns:

Column 1 is the sum of columns 2, 3, 5, 6, and 7. Column 8 is the sum of 3, 5, 6 and 21.5 per cent of column 2, where 21.5 per cent was the value estimated in 1976 as the Canadian equity ownership proportion in non-frontier natural gas production. The economic rents to Canadian consumers, and hence the total rent figures, exclude the estimates of economic waste shown in column 4. More specifically, the consumer surpluses are calculated by integrating the areas under the estimated demand curves, with the btu-equivalent to the world oil price being used to set the upper boundary to the calculated surplus and the price actually paid being used to set the lower boundary. The waste calculation for each year is the difference between the calculated consumer surplus and the product of the quantity consumed times the excess of world-equivalent price over the price actually paid by consumers. If the domestic prices were set equal to the btu-equivalent world oil price, the calculated values for consumer surpluses and waste for the year in question would both be equal to zero.

Case 2 Assumptions:
As in base case, except that all natural gas exports in and after 1980 are priced at 100 per cent btu equivalence with the assumed world oil price. The resulting export price is $4.14US in 1980, rising thereafter at 2 per cent in real terms.

Case 3 Assumptions:
As in base case, except that the domestic price of natural gas at Toronto City Gate is 81.25 per cent of btu parity with domestic crude oil in 1980, 77.5 per cent in 1981, 73.75 per cent in 1982, 70 per cent in 1983, 66.25 per cent in 1984, 62.5 per cent in 1985, and 60 per cent from 1985 on (until domestic shortages start to appear).

Case 4 Assumptions:
As in case 3, but with 2 per cent rather than 7.44 per cent used as the real rate of social time preference used to calculate the present values of net economic rents. (10.44 per cent is still used as the real social opportunity cost of the stock of capital invested in oil and gas exploration and development.)

Case 5 Assumptions:
As in case 4, but with the costs of providing for the projected future excess of domestic demand over non-frontier supply assumed to be 50 per cent greater than the btu-equivalent cost of world oil.

Case 6 Assumptions:
As in base case, except that the world oil price is assumed to fall in real terms by 2 per cent annually. This is 4 per cent less than in the base case.

Column 1 shows the total economic rents from non-frontier natural gas, including all past costs and benefits since the late 1940s and all future values projected until the exhaustion of the NEB's estimated 146 tcf about ninety years later. Column 8 shows the estimated economic rents accruing to Canadians. This differs from column 1 by excluding both the benefits to US export customers from the post-1973 pricing of natural gas exports at less than btu-equivalence with world crude oil and the net economic rents accruing to foreign owners of Canadian producing firms. In the base cases, with exports priced at 80 per cent of btu equivalence with world oil, about $6 billion of incremental net benefits flow to US purchasers and shareholders, compared to $8 billion dollars accruing to Canadian residents.[20] Case 2 shows what happens if existing and new exports are priced, in and after 1980, at 100 per cent rather than 80 per cent of the btu-equivalent price of world crude oil, where the latter is estimated at $US25 per barrel in 1980, rising thereafter in real terms at 2 per cent annually. In this case US export customers get no additional economic rents from existing or new export contracts, although the additional exports do produce $4 billion of incremental rents to US shareholders of producing firms.

The base case and case 2 both show substantial net economic benefits from additional export sales. Cases 3 to 5 are set up to see how sensitive these results are to changes in key assumptions. The three factors that are changed cumulatively in these three cases are: (i)domestic gas prices (lowered to encourage increased penetration of gas in Canadian markets), (ii) the rate of social time preference (lowered from 7.44 per cent real to 2 per cent real to reflect more importance being attached to the claims of future generations, or a lower expected real return on the investment funds obtained from current sales), and (iii) the cost that Canadian consumers will have to pay in future to find a comparable substitute for non-frontier natural gas when demand exceeds available supplies.

In Case 3 the domestic natural case price, which is at 85 per cent of btu parity with domestic crude oil prices in the base case, is progressively lowered, relative to the crude oil price, until it reaches 60 per cent of btu parity in 1983. This has the effect of bringing forward the projected date of non-frontier sufficiency by eight years, from 2016 to 2008. This is the date when 'something' must be found to fill a subsequently growing insufficiency of non-frontier production to meet domestic demands at prices which by then have been pushed up to btu parity with world crude oil. The net economic benefits of incremental exports are scarcely altered. This is because the discount rate of almost 7.5 per cent is high enough to almost eliminate any impact of shortages arising thirty years hence.

The importance of the discount rate is shown forcefully in case 4, where the assumptions of case 3 are altered by lowering the discount rate from 7.44 per cent to 2 per cent. Total economic rents from the natural gas resource are much increased, because most of the investment is in the past and most of the production is in the future. By contrast, the net economic benefits to Canadians from incremental exports are cut from $8 billion to $2 billion, and the Canadian share of incremental rents drops from 60 per cent to 20 per cent. This is because the gas sold in the near future to US customers must be replaced by higher-cost sources later on.

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[20] The export price used in the base case is equal to that recommended by Daryl Waddingham in his commentary on my paper, 5 p er cent less than the actual export price applicable in November 1979 and 10 per cent less than the price established for sales of Mexican gas to the United States.

Case 5 is an attempt to quantify the worries of those discomfited by a projected future shortage not matched by any clear idea of what the replacement fuel will be or what it will cost. Case 5 combines the case 4 assumptions about pricing and demand with the assumption that all future natural gas demand not met from the 146 tcf of ultimate non-frontier gas reserves forecast by the NEB will only be provided at a cost of 50 per cent above the projected cost of world oil.[21] This has a dramatic effect on the net economic effects of additional exports, as the net Canadian benefits that were $8 billion in the base case become net costs of $9 billion in case 5.

The substantial changes in results that arise as the future becomes less attractive in cases 3 through 5 help to illustrate the sensitivity of the results to cost assumptions.

Case 6 has been calculated in response to a question raised at the conference by David Foot: if future energy prices were lower than today's would export opportunities forgone today be regretted tomorrow? In case 6 the real world oil price is assumed to drop annually by 2 per cent after 1980, while all other assumptions are the same as in the base case. In this case the total rents from the resource are of course substantially smaller than in the base case, by proportions that are more or less independent of the volume of exports. As expected, the value of incremental exports, as a fraction of the total resource rents, is slightly larger when world oil prices are falling rather than rising through time, although the magnitude of the effect is very small.

A final word of caution may be in order, although it may equally be unnecessary. The various cases reported in Table 2 are intended to illustrate the relative importance of some key uncertain factors that influence the economic attractiveness of additional exports of natural gas.

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[21] The negative effects of this assumption are amplified by having natural gas demands depend on btu-equivalent prices with world oil, even though the actual costs are 50 per cent greater.

There is no single case, or combination of cases, that can be considered the only right answer, and I have deliberately presented a number of alternatives without attempting to guess their likelihoods. I hope thereby to show that the results are bound to reflect a great deal of uncertainty, and any judgments must necessarily contain a large subjective element. This is inherent, of course in the decision problem facing any owner of a non-renewable resource.

ELECTRICITY EXPORTS

This section must be smaller than that for natural gas because space is limited and so is the range of open policy issues. The provinces have tended to operate independently in electricity supply, beyond short-term grid interchanges and the long-term shipment of Churchill Falls power to Quebec Hydro and hence to Quebec and United States markets.[22] Export sales tend to be of two types: short-term interchanges to deal with daily or seasonal shortages and surpluses, and longer-term sales arising when one of the provinces has built its system beyond current requirements and attempts to use export sales to minimize the costs of carrying excess capacity. The issue of electricity exports has long been a sensitive one.[23] The production of electricity expressly for export markets is difficult to justify on political and distributional grounds, because there is not a single jurisdiction in Canada in which major new power developments do not raise a host of environmental objections. Such environmental issues, whether relating to nuclear power plants, nuclear waste disposal, uranium mining, damage to river valleys, or the side effects of major transmission lines, entail a multitude of tricky distribution problems. One of the key strengths of the developer's position has usually been the argument that the additional electricity is a key element in assuring that one's neighbours should have lights and that the motors of local industry should be kept turning. At this stage of the planning process export sales cannot easily be included as part of the purpose of the project, unless the costing of and compensation for environmental degradation were carried much further and were more widely accepted as a solution than is now the case. For a variety of reasons, many Canadian electric utilities have overbuilt their systems in the past decade, despite the project slowdowns caused by environmental concerns and financial stringency. Some have then used export sales and sales-increasing (rather than cost-minimizing) rate structures to cut the gap between peak demands and system capacity. This current and expected future excess capacity is apparently more than exists in neighbouring US systems, so that current and planned export sales are of substantial size.

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[22] To illustrate how separately the provinces plan their electricity systems, a recent US/Canada study (1979) on electricity exchanges notes that for most Canadian provinces the transfer transmission potential with the United States is greater than that with neighbouring provinces. (23)

[23] A perceptive historical survey by Grauer (1961) records that export sales reached 20 per cent of domestic production in the early part of the century, and many projects were foreign-owned and oriented to export markets. The difficulties in reducing the export levels as Canadian electricity needs grew were in large measure responsible for subsequent legislation restricting electricity exports and establishing an electricity export tax.

The main provinces with electricity exports have been Quebec, Ontario, and British Columbia. In the case of Quebec the main export in the past has been Churchill Falls power, and in the future it is likely to be James Bay power, which is almost certain to increase Quebec's generating capacity faster than demand could grow under almost any pricing policy. In Ontario the main exports have been of power generated using U.S. coal.[24] The policy issues that arose in the NEB hearings about Ontario exports has to do with whether Ontario Hydro had made due allowance for the pollution consequences of importing coal and exporting electricity. Applications of that type are most unlikely to concern long-term exports, given the costs of moving coal and electricity and the environmental perversity of generating power in one large urban area in order to send it off hundreds of miles to another.

In British Columbia exports tend to arise either from unusual water conditions that exceed usable storage capacity, or, as in the past two years, because the system has been overbuilt because of overestimates of demand growth.

One puzzle is that electricity trade between Canada and the United States, while justified mainly by using system interconnections to share peak loads, has become much more southbound than northbound. Over the latter half of the 1960s, electricity exchanges between Canada and the United States were more or less in balance, while between 1972 and 1977 annual Canadian exports ranged between three and eight times the level of imports from the United States, with the latter remaining roughly as in the preceding years. This pattern of net exports is likely to continue over the next decade, as the winter-peaking Canadian utilities forecast proportionate winter reserve margins about as large as their US neighbours but summer reserve margins roughly twice as large as in the United States.[25] Canadian utilities are planning to increase the existing 8000 megawatts of transmission lines to the United States by almost 5000 megawatts by 1985, an increase of more than 60 per cent.

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[24] The extent of the exports is documented in Ontario Hydro (1976), in which the utility spells out its export policy and its request for permission to increase its permitted exports by a factor of three between 1976 and 1985. Planned volumes and prices for 1980 export sales are reported in Ontario Energy Board (1979).

One interpretation of the increasing southbound flow might be that Canadian utilities have been more effective in guaranteeing security of supply to their own users and have therefore more often had spare capacity to share with their more restricted US counterparts. Another might be that wasteful overbuilding has been more common in Canada than in the United States. A third possibility, more applicable to the jurisdictions with mainly hydro capacity, is that establishing any given level of supply security in a rainfall-dependent system inevitably requires a higher average degree of underutilized capacity and hence a higher average capacity to make export sales.

A fourth possibility is that the prices obtained from Canadian export sales have been relatively low, thus encouraging US utilities to draw increasingly on lower-cost Canadian sources rather than their own marginal thermal units, whose fuel costs have been rising rapidly. The recent joint US/Canada study group, comprising representatives of US and Canadian utilities and of regulating agencies in both countries, noted: 'In regard to the National Energy Board pricing rule which requires that the price of an export be not materially less than that of the least-cost alternative in the United States, it should be noted that the Board has always exercised a great deal of discretion in applying this rule and given recognition to the necessity of providing a sufficient financial incentive to the purchaser in the light of any large capital outlays on transmission facilities which may be involved'(99).

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[25] See US/Canada (1979)for past electricity flows, (14), for the projected winter and summer reserve margins between 1978 and 1987 (32a), and for the expansion plans for the international transmission lines (38).

In practice, the pricing of short-term 'economy' exports is at the average of the short-term marginal generating costs of the buying and the selling utilities. Whether this price is 'materially' less than that of the least cost alternative in the United States, and hence in contravention of the NEB's rule, must depend on the circumstances. The Ontario Energy Board (1979, 154) reports that Ontario Hydro's estimates of its short-term marginal costs are 1.8¢/kWh, compared to 3.4¢/kWh for its export customers. This means that the projected 7280 GWh of 1980 'economy' export sales will be sold at $190 million, while the least-cost alternative for the export customer would presumably cost almost $250 million (more precisely, 34 x 7.28). Thus the 'economy' power is being sold at almost 25 per cent less than the least cost alternative for the export customer, and the annual amount of the discount, almost $60 million, seems large enough to merit attention.[26]

The pricing of 'capacity' exports in 1980, which comprise the remaining 3750 GWh of Ontario Hydro's planned total exports of 11,000 GWh, is equal to Ontario Hydro's short-term marginal cost plus 1.8¢/kWh. This brings Ontario Hydro's average export price up to only 86 per cent of the short-term marginal costs of the US export customers. The costs of incremental capacity in the US system are not reported by the Ontario Energy Board (1979), so the extent to which the capacity sales are less than the least cost US alternative cannot be estimated.

The foregoing cursory review of the pricing of one province's electricity export pricing raises more issues than it settles. Apparently the National Energy Board has tended to leave the pricing of such exports almost entirely in the hands of the buying and selling utilities. The pricing practices followed go some way towards explaining why there have been increasing demands for Canadian electricity exports.

The combination of a growing volume of net electricity exports, the plans for substantial increases in international transmission capacity, and an export pricing policy apparently designed to support those investments in transmission lines suggests to me that electricity exports are likely to raise more policy issues in the 1980s than they have so far done in the 1970s.

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[26] Hydro Quebec exports are apparently now sold at 80 per cent of the marginal costs of the buying utility. Under most water conditions this represents a higher price than the average of the buyer's and the seller's marginal costs.

A final question, to which I have nothing to contribute, is whether the greater export orientation of the natural gas industry compared to the electricity industry is based on differences between the US/Canadian cost and demand conditions in the two industries. Alternatively, could it have more to do with the fact that the main leadership and activity in the oil and gas industry has come from US-controlled firms, while electricity supply has long been in the charge of provincially owned firms? At the very least, the fact that the main electrical utilities are provincial crown corporations in all provinces but Alberta has probably meant that the NEB has tended to intervene less in the prices and qualitites of electricity exports than they have, at least since 1974, in the case of natural gas exports.

CONCLUSION

This paper has dealt at some length with the issues raised by past and possible future exports of natural gas and, to a much lesser extent, of electricity. In the case of natural gas exports, past experiences and current uncertainty about the size and cost of future discoveries suggest caution and flexibility in dealing with new export proposals. Thus any commitment to export gas through the pre-built southern portions of the Alaska Highway system should be restricted to the minimum period. This would make it clear that the Canadian gas is not expected to be a long-term substitute for the Alaska gas, and that Canada is able to provide no assurances that the exports will continue if the Alaskan segment should not be built. If the Alaska Highway pipeline cannot be privately financed on that basis, with or without US government support, then Canadians would be better off without the project, and with a longer and smoother flow of exports that makes use of marginally expanded existing facilities. Other export approvals should also be on a short-term basis, or could involve some conditional extensions of licences due to expire soon. Any extensions, whether conditional or not, more than five or six years into the future involve some loss of planning flexibility against which there is no foreseeable gain. Facilities expansion predicated on export expansion would therefore be kept to a minimum, thus increasing the marginal return on the export sales. A final advantage of the cautious approach to new exports is that it would increase the chance that the permitted volume of exports could in fact be sold at a price high enough to exceed a reservation price based on more valuable future domestic needs or future export sales.

By contrast, the ownership and planning structure of the electricity supply industry is such that there is much less likely to be any major export-oriented expansion of capacity. Thus the major policy issues concern the efficiency of investment, pricing, and distribution decisions and the prices of export sales and do not involve difficult tradeoffs between current export sales and future domestic use.

REFERENCES

Alberta, Energy Resources Conversation Board (1979), Summary Report on Alberta Gas Reserve and Removal Matters Report79-B, June 1979

Canada, National Energy Board (1975) Canadian Natural Gas: Supply and Requirements (Ottawa)

Canada National Energy Board (1979) Canadian Natural Gas: Supply and Requirements (Ottawa)

Canada, Royal Commission on Energy (1958) First Report, (Ottawa) (The Borden Report).

Canadian Resourcecon (1978) Twenty-Five- Year Forecast of Natural Gas Requirements 1978-2002, Inland Natural Gas Service Area (Vancouver)

Grauer, A.E. Dal (1961) 'The export of electricity from Canada.' Canadian Issues. Essays in Honour of Henry F. Angus In Robert M. Clark, ed., (Toronto: University of Toronto Press) 248-85

Helliwell, J.F. (1975) 'The National Energy Board's 1974-1975 natural gas supply hearings.' Canadian Public Policy 1, 415-25.

Helliwell, J.F. (1977). 'Arctic pipelines in the context of Canadian energy requirements Canadian Public Policy 3, 344-54. (Based on evidence submitted to the National Energy Board in March 1977. Different versions of the same basic result have also been published in the Financial Times, 18 and 25 April 1977, and in the Canadian Arctic Resources Committee's Northern Perspectives, 5, No. 2, 1-4)

Helliwell, J.F. (1979). Canadian Energy Policy.' Annual Review of Energy 4, 175-229

Helliwell, J.F. with B.C.E. Duncan, K. Hendricks, R.N. McRae, G. May, and D.B.C. Williams (1979).' An integrated simulation approach to the analysis of Canadian energy policies.' In P. Nemetz, ed., Energy Policy: The Challenge for North America, (Montreal: Institute for Research on Public Policy) (Also appearing as a special issue of the Journal of Business Administration, (1979).

Inland Natural Gas Limited (1978) 'The potential impact of gas utilities and their customers from implementing the wholesale pricing policy enunciated in the commission's 1977 report.' Submission to the BCEC 1978 Oil and Natural Gas Price Hearing (Vancouver)

Kierans, Eric W. (1974). 'The day the cabinet was misled,' Canadian Forum March 1974, 4-8.

Ontario Energy Board (1979). Ontario Hydro Bulk Power Rates for 1980 (Toronto) H.R.- 8

Ontario Hydro (1976) 'System Interconnections' Memorandum of Ontario Hydro to the Royal Commission on Electric Power Planning with respect to the public information hearings. (Toronto)

Scott, A.D. and H. Campbell (1979) 'Policies towards proposals for large-scale natural resource projects: attenuation vs. postponement.' Resources Policy June, 1979 113-40

Uhler, R. (1979). Oil and Gas Finding Costs (Calgary: Canadian Energy Research Institute)

United States Department of Energy/Canadian Department of Energy, Mines and Resources (1979) United States/Canada Electricity Exchanges (Washington)

D. Waddingham

The title of the paper could have been something like 'Trade policies to ensure future energy shortages in Canada' or 'How to create an energy shortage without really trying.' For in my judgment the author tries to build a case on the premise that future uncertainty with respect to energy supplies and their relative costs make it imperative that we limit the conditions and quantity of natural gas that may be exported. In my opinion, he fails to place enough weight on the impact that conservationist policies might have on future exploration and development and hence on new supplies of energy. Furthermore, his recommendations regarding export prices have placed too much emphasis on 'commodity-equivalent pricing' and not enough on marketing considerations and the competition from alternative fuels.

Before I address these general points in more detail, I would like to make a few observations on energy trade.

Table 1 of the paper showed net export balances in energy commodities. Trade in energy as defined reached $1.7 billion in 1974. By 1978 it had risen to $1.9 billion. The reader is left with the impression that our trade in energy is increasing, in spite of the rapid deterioration in petroleum commodities. If the energy sector were defined to exclude petroleum products (butane, propane, etc.) and uranium, which require energy to be upgraded to produce energy (and are more closely associated with the chemical and mining industries respectively), the surplus on our net energy commodity balance would only be $831 million in 1978 compared to $1.4 billion in 1974 - a decline of $600 million. Converting these balances to 1971 dollars reveals an even sharper deterioration, because I estimate our net trade in energy has declined by over 25 per cent annually.

The answer, of course, lies mainly with crude oil, exports of which to the United States were sharply curtailed in 1975 by official policy action. But it is also important to note that exports of natural gas to the United States, after peaking at a little more than one a trillion cubic feet in 1973, have never regained this level. In fact in 1978, with authorized exports unchanged at 1.1 tcf, only 0.9 tcf were actually sold. Because of the substantial rise in natural gas export prices our net trade in natural gas has appreciated enormously, offsetting in part the decline in crude oil. But in constant dollars our net balance in natural gas has fallen by 2.7 per cent annually since the peak reached in 1973 -- largely because of the drop in volume.

My purpose in presenting these facts and figures is three-fold:

- In defining energy policy an appropriate definition of the energy commodities trade must also be established. Whether our energy self-sufficiency is growing depends on the definition and on the policies applied to the definition chosen.
- The rapid decline in our crude oil account is likely to become much greater in future. Exports of natural gas are clearly not offsetting this at present, - and this trend may get worse.
- The paper referred obliquely to the energy trade balance as a leading indicator of the strength of a country's currency. To some investors energy is now almost akin to gold in evaluating a country's economic risk.

I think it's time that energy trade be explicitly recognized as an integral part of Canada's public policy-making, as is the automobile sector. Energy trade in future is likely to become one of the most important issues facing Canada, and if not handled correctly the results could be catastrophic for the balance of payments.

I would now like to focus on some of the specific findings of the paper regarding export pricing and marketability.

The author makes extensive use of past policies in arguing for higher natural gas prices. It is true that in the early 1970s the BTU-equivalent price of natural gas exports was substantially below crude oil prices, but this anomaly has now disappeared. In 1977 the National Energy Board, albeit belatedly, introduced the concept of substitution value as the criterion for determining the appropriate selling price for natural gas exports. This was to be represented by the cost of displacing crude oil in eastern Canada with natural gas. Using this criterion, since 1971, natural gas export prices have risen by 786 per cent to the end of 1978, compared with an increase of 577 per cent for imported crude oil. Hence, natural gas prices, especially after 1975, have caught up with imported crude oil prices based on the BTU-equivalent pricing formula adopted by the National Energy Board.

Where I disagree with the author is in the use of the export price of light Canadian crude as the appropriate reference price. At $30 a barrel, Canadian crude is one of the most expensive crudes bought by the United States. This is because of its superior qualities and the dependence of several landlocked northwestern refineries on a single source of supply.

But to price natural gas on BTU-equivalent basis does not recognize the competitive nature of the interfuels market in the United States. By exporting Canadian natural gas at over $5 per thousand cubic fee (mcf), our price would be substantially above those of the existing alternatives to gas, namely No. 2 fuel oil and No. 6 fuel oil (residual). This is especially true in the Pacific Northwest, served by Licence GL-41, where pricing competition from low-cost power and heavy fuel oil from Alaska crude have already eaten heavily into export sales, which as I mentioned dropped down to 0.9 tcf in the last couple of years.

In addition to monitoring the impact of fuel alternatives, the passage of the U.S. Natural Gas Policy Act of 1978 resulted in an increased annual surplus deliverability of nearly 1 tcf of gas on the intra-state markets. The U.S. under a regime of decontrol is rapidly adding to established reserves and supply deliverability - thus reducing the demand for imported gas.

Using the National Energy Board substitution value as defined, the present export price, at $2.80U.S., is currently below the estimated cost of imported crude oil landed at Toronto by some $0.50 cents per mcf. However, by 1 October the current price is likely to be reviewed again, and a further adjustment to $3.30U.S. would restore this basic equilibrium. At this price Canadian natural gas exports would still be competitively priced - especially for residential and commercial end uses in the United States.

A final factor, which recently has become important in the marketing of Canadian gas in the United States, is the availability of other imports, most notably Mexican gas. The recent agreement between Mexico and the United States which John referred to, has established the initial sales of natural gas at $3.625 per mcf. This price was obviously a concession by the Americans, who had previously insisted that the price should be based on No. 6 fuel oil (residual). However, the small volume and high price should not pose serious immediate marketing concerns to Canada unless we attempt to price on the same basis as Mexico. Undoubtedly there will be pressure on the National Energy Board to raise our prices to match Mexico's. In my judgment, caution must be exercised so as not to place at a competitive disadvantage current exports to the west coast. Some 555 bcf, or 63 per cent of our export sales in 1978, primarily served this market. Furthermore, Canada supplies 36 per cent of the California natural gas market, so that energy officials in California may already be looking for new long-term sources of supply to diversify their supply base.

Thus, higher export prices should be set with the realities of the export market firmly in mind. We are not, as the paper argues, in an excess demand situation, and hence higher export prices would not unequivocally increase the net benefits to Canada.

Turning to the domestic market, the proposal to earmark adequate reserves to serve the eastern Canadian and Maritimes markets does not recognize explicitly the problem of excess supplies of residual oil now serving those markets. Refinery yields of residual oil account for 32 per cent of production in the Maritimes, 24 per cent in Quebec, but only 16 per cent in Ontario. Until an acceptable solution to this problem is advanced, it is unlikely that any market penetration by natural gas in industrial markets can be made in Quebec or the Maritimes. Furthermore, since the gas in any case would have to be sold at a 50-60 cent per mcf discount to facilitate market penetration and substitution, it seems preferable on a net yield basis to export the gas. Prices are most likely to be considerably higher in the export markets because a higher mix of gas volumes would be moving to high-value (residential/ commercial) than to low-value end users. In sum, the reservation of gas for future domestic markets may be better served by seeking alternative energy supplies such as electricity or coal in those regions. A strategic petroleum reserve could be established to offset the impact of supply disruptions in the interim until the residual oil problem is dealt with. But the export market looks more viable because: there would be higher netbacks to the producers, thus encouraging more supply; it has lower transportation costs; and the volumes in the extension markets look relatively limited and may still lead to shut-in gas reserves in western Canada.

Finally, if we are to consider the export option seriously, we must act soon, because commitments for other supplies are already being made in the United States, most notably for Mexican and Indonesian liquefied natural gas.

FOREIGN OWNERSHIP

The point has been made several times in this conference that profits generated in the petroleum sector accrue 75 per cent to foreigners on either a current or deferred basis. That statistic may be generally true for all petroleum operations, but in recent years smaller companies, mainly gas producers which are mainly Canadian-controlled, have been benefiting to a greater degree than oil producers and/or refiners and marketers, where foreign ownership is concentrated.

It has been estimated by Energy, Mines and Resources that at the close of 1978 Canadians owned 34.5 per cent of the Canadian petroleum industry, up from 24.1 per cent in 1972. Although data are not available for gas producers, I would venture that Canadian producing firms have benefited to a much greater degree since the imposition of price controls than have the large integrated foreign petroleum firms.

Notwithstanding the over-all trend of ownership discussed above, we often hear how Canadian industry is being bought out by foreign concerns. This is happening today in our oil and gas business simply because increased market opportunities for Canadian gas do not exist at present. To continue in operation, the firms involved, mainly small exploration and development companies, are forced to sell off their shut-in gas - mainly to the large multinationals. There is nothing new about that. It has been going on for a long a time, but it affects the whole question of ownership.

Furthermore, many Canadian firms because of lower royalties are moving south of the border where higher netbacks are available and access to markets through existing pipelines make immediate higher cash flow available.

Finally, on gas supply and costs, the pessimistic cost curve calculations presented by Uhler would probably yield a much higher estimate of the ultimate stock of reserves if the data observation period were extended to cover 1975-8, rather than just 1950 to 1975. Trend additions have annually reached 5-6 tcf a year since then, and drilling activity has been unprecedented, with six to seven thousand wells now being drilled annually. It is not surprising that wellhead prices had no significant impact in the tests conducted, because Canadian prices moved from $2.27 in 1960 to only $2.77 by 1972. Even by 1975 the wellhead price, at $7.18, was only half of today's price.

It seems to me that more important variables affecting net reserve additions and exploration activity are not the costs themselves but the producer netbacks and the availability of markets. Producer netbacks have climbed ten times since 1972 and are now averaging over $1 per mcf. The expectation of higher wellhead prices as Canada gradually deregulates oil and gas prices must also be an important determining factor. It is not known with certainty how long present additions to gas reserves can be maintained. What we do know is that reserve additions are price-elastic, as shown by the sale of drilling rights and the new reserve additions made in the past six years. At the present time our reserve-to-production ratio is over 26½ years, excluding frontier resources. If frontier resources were added, the ratio would be over 32 years, not much different than 1969. Hence reserve additions have kept pace with production, unlike in many other countries today, especially the U.S.

But the key to future gas supply also rests with free access to markets. Restricting markets for fear of supply shortages or for future generations' use can only be a self-fulfilling prophecy. Since markets in eastern Canada will not be purchasing any new supplies of western Canadian gas under contractual agreements with TransCanada PipeLines until 1984 at the earliest, restricting the growth of the western producers to the domestic market will surely bring forth the day of higher cost energy.

Electricity sales abroad in 1978 amounted to over 20,640 megawatts, producing $479 million in export earnings for Canada. Electricity now accounts for 10 per cent of our energy export sales and has grown in volume terms by nearly 20 per cent a year. Electricity is playing an increasing role in our energy trade balances and represents a unique natural trading advantage to Canada, given the natural waterfall sites available and our expertise in developing Hydroelectric power. Moreover, we have been able to dispose of our surplus power advantageously: over 80 per cent of our electricity exports are interruptible by value and volume, so that little loss of flexibility has occurred. And the price to Canada for interruptible power, at $23.19 per thousand kwh in 1978, was only slightly less than our firm power exports.

Both may of course be undervalued. Since 1971, electricity export prices have increased by 211 per cent, whereas natural gas and crude oil export prices increased by 786 per cent and 452 per cent respectively to the end of 1978. Since Ontario accounts for over 61 per cent of electricity exports, mainly in interruptible forms, it might be fair to ask why export prices have not risen faster, especially in view of the rapidly changing mix of electrical generation capacity towards higher-cost fossil fuel and nuclear power sources.

In future I would favour building more export-oriented expansion of capacity, especially hydroelectric generation, such as the Gull Island Project. The advantages to Canada are obvious: it would help the balance of payments, provide increased employment, especially in the eastern provinces which are highly dependent on imported oil, and would ultimately afford a cushion of excess energy supplies to meet unforeseen supply disruptions. Moreover, the export of electricity to the United States would help alleviate energy shortages in the economy of our major trading partner and would obviously contribute positively to Canadian-American political and economic relations.

I sum up my comments regarding natural gas and electricity trade policies in the following points:

- We must define the external energy sector more carefully for policy purposes.
- Energy trade should be recognized as an integral part of public policy-making.
- Natural gas export prices should reflect the realities of the export marketplace.
- Natural gas exports provide a better economic return than the extension markets of eastern Canada.

- Policies to deal with residual oil must be developed first before natural gas can penetrate eastern markets.
- Canadian ownership of natural gas production is now more widespread. Canadian companies, especially gas producers, are benefiting to a greater degree than foreign-owned firms from natural price increases.
- Cash flow and netbacks are more important than finding costs in bringing new reserves to market.
- Export prices for electricity may have been too low.
- Restricting markets for fear of supply shortages may be a self-fulfilling prophecy.

In conclusion, I realize that a proper balance between conservationist-type policies and full-bore export schemes must be developed. I am not advocating a reckless irresponsible option. We do have a responsibility to future generations. On the other hand Canadian energy trade in electricity and natural gas may present us with one of the few options we have to reduce our chronic external payments imbalance in the 1980s. It may indeed provide the springboard to launch the economy on a new path, closer to our economic potential. Let's not miss it by being too cautious.

B. W. Wilkinson

If my memory serves me correctly, John Helliwell a few years ago stood almost alone in Canada against industry, governments, and university geologists and engineers in his position that an expensive gas pipeline from the north was not required for many years to come, because among other reasons, large, accessible reserves of gas remained to be discovered in the non-frontier areas of western Canada. As we all know, events have proven him correct. The same expertise that enabled him to comprehend, digest and look forward from the circumstances and events of those earlier years, is evident in the fine paper he has presented.

Because I find myself agreeing with most of the paper, both as to its observations and tentative conclusions, my remarks are primarily intended to raise a number of issues for examination in the discussion which follows.

First, as more of the world becomes industrialized and pollution becomes increasingly important, more resources will have to go into anti-pollution devices - which will lower productivity. Gas is a much cleaner fuel to burn than oil or coal and involves fewer actual or potential environmental problems in its production than do oil sands, coal, and nuclear energy. Have we not therefore another reason to preserve domestic natural gas supplies and to move only cautiously forward and for limited time periods with exports?

Second, there are fairly clear indications that the USSR will have to rely heavily on oil imports in the years ahead. If they wish to buy from OPEC, will not the seriousness of the present situation with regard to both supplies and prices greatly worsen? Does this not also support Helliwell's position that gas exports should be limited? And does it not also suggest that measures to encourage more domestic substitution of natural gas for oil would be worth pursuing more vigorously?

Third, what if the United States continues to augment its vigilance against manufactured exports aided by what they interpret to be export subsidies by foreign countries - such as regional locational grants or possibly natural gas input prices below export prices? If the United States really needs Canadian gas, could not gas exports that do go to them be used as a bargaining tool to gain better access for other Canadian processed goods?

Fourth, I am pleased to note that John Helliwell also sees that the large foreign presence in the industry complicates in a variety of ways Canada's deriving net gains from resource exploitation and production. However, with regard to his view that in resource exploitation new technology may be developed from learning by doing I might add that chances of Canada's gaining from selling such information abroad are greatly lessened if the technology belongs to the foreign-owned segment of the industry. It is gratifying to see that the most important and exciting new technology to be developed in the industry in recent years was by a hitherto virtually unknown Canadian-owned firm, Canadian Hunter. The huge transnational corporations had given up on finding new oil and/or gas reserves in areas such as West Pembina. Hunter has proved them wrong. Obviously it is important to provide encouragement and incentives to those with new ideas.

Finally, has Helliwell, or anyone, given thought to governments' buying up, at current prices, some of the proven gas reserves in the ground? Could not those companies wishing to export more gas to improve their cash flow position perhaps be satisfied in this way to some extent? Such an investment might be worthwhile one for part of the Alberta Heritage Trust Savings Fund.

Discussion

QUESTION: I want to second what Bruce Wilkinson said, that John Helliwell, because of his independent analysis of the energy sector, has made a significant and important contribution to this country. However, in presenting his results I think John has taken six points of view. I know that you are really doing some sensitivity analysis, but what I want to know is your position now. Which of these runs do you think is the truth? If this were the National Energy Board, what policy on natural gas exports would you recommend for Canada?

J. HELLIWELL: I regard myself as a resource person, presenting facts rather than opinions. As a consequence I found opinions being attributed to me that I didn't know I had. And I have been so vague that on some things on which I find it very easy to have opinions, such as what cost curve for natural gas is the more appropriate, I left totally the wrong impression.

You may remember that I had two cost curves. One was analytically derived from Uhler's finding in which the driving variable is the wellhead netback. That's what makes people explore; the tradeoff is wellhead price against the cost of finding the gas.

The other curve I call the Hunter view because it was roughly consistent with the kinds of things Canadian Hunter had been putting forward. I find on more detailed analysis that the line I drew for the Canadian Hunter position was too high. Both Canadian Hunter's own analysis and the Alberta Gas Trunk analysis suggest that the quantities are much larger than in my present graph for Canadian Hunter, and the costs are much lower. When I rework this paper for publication that will be the top line in the Canadian Hunter band, which will have one more flatter curve that goes out some great distance.

Now I have built into the model an essentially conservative view of supplies. There is an ultimate reserve of 146 tcf - a view which as you will note from my paper is already obsolete. The ACRCB is now talking about 130 to 140 tcf for Alberta alone, and any conceivable estimate for B.C. and the rest of the non-frontier country would get us up to 160 tcf without trying.

Then I put in a cost curve that is not far from the Canadian Hunter higher line but in fact is higher because it peaks out essentially at 146 tcf. So in a sense my cost estimates are much less optimistic than the Canadian Hunter ones in the model and much more optimistic than the Uhler one. Simply draw the Uhler line and you realize it is completely false. It is quite counter to the argument I have been making over the last five years, and it is quite opposed to the argument I made in the paper where I gave the distributions and showed how the change in price shifted the whole distribution. It doesn't simply change the minimum pool size that is worth developing. You may regard the Canadian Hunter position - and you haven't seen it all yet - as being on the optimistic side, but you must take it seriously because it represents the view of the leading edge of the industry in terms of the analysis of supply. They are drilling the wells and finding the gas and developing the technology at what is a very low cost compared to frontier gas or synthetic oil. The development costs in oil equivalents are $5000/barrel/day compared to Syncrude's $20,000 to $30,000/barrel/day. So these are large quantities of gas at very much lower prices. I just want to give you the flavour without committing myself to a particular cost curve. The true cost curve as it unfolds will surely look more like the Canadian Hunter top line. In other words they are less optimistic than the Uhler line. And we shall find that the ultimate quantity discovered at costs lower than the current netback and at today's world oil prices will be much over the 150 or 160 tcf. Whether it will be above 200 tcf is a little more doubtful, but it will be large.

With respect to our Canadian pricing assumption, I would guess that 85 per cent is now the ceiling rather than the floor for relative gas and oil prices over the next decade or more. I suspect the government is going to be inclined to back out of gas regulation. Instead of trying to pick a number and go for it, they will be inclined to let discount pricing evolve on its own through the efforts of various people in the chain, perhaps restricted by controlling the powers of some of the people up and down the system, so that final users can bid a little more directly from the people in the field. The relation will probably settle down somewhere between 85 and

60 per cent. I don't think it will go as low as 60 per cent, so maybe 80 per cent or something of that order makes sense.

Now we get down to the really tricky questions. Is 7½ per cent or 2 per cent a better rate of social-contract price in terms of the long-run real return on investment in the Heritage Fund? I think 2 per cent is closer than 7½, though I think the true number is in between. Five years ago I would have said 5 to 7½ per cent was the range. Now I think the kind of productivity growth we can expect in the industrial world economy is lower than we had anticipated when we expected an easier, flatter supply curve for energy sources. Lower productivity growth and lower real return on investment over this period means the social contract preference may be rated closer to 4 and 2 is a relatively safe alternative.

As to whether the world oil price will go up or down, I am not the right person to ask. I thank you for saying I was right on a couple of issues, but I have been totally wrong on the Iranian one. I simply didn't factor that in at all. I wasn't doing any modelling on the assumption of world oil prices doing anything other than being constant in real terms at pre-Iran levels. I am now happily setting up a base case that has today's world oil price being reached and growing at 2 per cent a year. It's in part maybe over-responding to the Iranian situation. It's not at all clear that Kuwait is immune to the same kind of risks as Iran, and they will respond to them by being conservative in their production.

I have a hunch that 2 per cent growth won't hang on for twenty or thirty years. Maybe we'll have a 2 per cent average for ten or even fifteen years, but I take soft energy paths much more seriously than I suspect most people here do. We'll find ways of doing what we want to do with very little energy other than the traditional hard BTU sort. If so, that will turns things around very substantially. Sooner or later I am sure that revolution is going to take place; how long it will take I am very uncertain about.

For the moment, my best guess would be that the 2 per cent real decline will continue for ten years followed by a flattening. But that is too much of a conjecture to build into a model.

QUESTION: Two questions. First, the National Energy Board has recently come up with a new formula for determining when exports will be permitted from Canada. They now have three criteria: reserves, short-term deliverability, and long-term deliverability. Dr Hartle in his paper suggested that federal deregulation of gas export volumes and prices would be accepted by the provinces. This may be so, but would it be in the national interest? It seems to me that the National Energy Board formula, as currently laid out, does take account of the national interest before allowing export volumes of gas from Canada.

Second, a general supply and demand forecasting question, particularly on the supply side. It seems to me that as a starting point we want to have a reasonable fix on what supply and demand for energy are going to be. About 1972 the Department of Energy, Mines and Resources published a green paper saying basically that Canada had an abundance of oil and gas reserves, enough to last until the year 2050. In 1975 the National Energy Board gas report said we were in trouble. Now in 1979 we have come up again on the roller coaster and we have gas to burn. I realize that there are economic, technical, and engineering uncertainties, and of course there are political uncertainties. So no one can expect solid supply and demand forecasts, particularly on the supply side. But have you any suggestions about how we could narrow the range of uncertainty in supply forecasts for natural gas and oil?

J. HELLIWELL: On the question of the NEB's new tripartite formula for establishing whether exports are permitted or not: unequivocally that is a better set of arrangements than the previous one. From an economist's point of view, of course the potential reserves and their ascertainability are important to establish because the last thing you want to do is to get equipment to the wellhead twenty-five years before it's needed. In a sense the kind of modelling we do is what the NEB should be doing when analysing whether or not there is now a surplus; in other words the model should be based on a specific idea of future costs, not just the quantity of reserves now on hand. You can't tell whether the thing makes sense until you do the full analysis.

I suspect there has been an underinvestment in the right kind of research. You can drill more intellectual holes to save on physical holes. I am convinced by the methodology that Canadian Hunter used, but why didn't anyone else do it sooner? They didn't even drill for quite a long time. They went back to all the old drill stem results and asked what could be done with all the holes people were drilling when the wellhead prices were nine or ten cents. Now we can easily see $1.10 at the wellhead. Of course they found pay shoals that were economic, and they interpreted that old geology, using information that had been stowed away ten years before, and came back with a much higher success rate than could have been achieved before. The Uhler model said that whatever happened after 1974 you would still have lower success rates than before 1974. But that's not true at all. The success ratio on exploration statistics, once down to 20 per cent, has now been solid for four years at 55 per cent. The reason is that we went back and opened the old maps. The whole economics have changed, and we can make use of that past information. Such an obvious analysis could have been done five or ten years ago; it wasn't, and my guess is we would have made better policy and people would have made better investment decisions had it been done.

The full ramifications of this interplay between the geological facts, the economic pressures, and the technological development could have been much more precisely and fully worked out than it has been. It takes $20 million to drill one hole in the arctic islands, but you will learn an awful lot less from one of those holes than from financing broad-based research with that $20 million.

On the question of export pricing and quantities, one of the points I make in the paper is that in the past it has been not at all clear to me that the NEB has even thought of a demand curve in the export market. They simply set a quantity and did not worry much about price. The general point is that you can't possibly be doing as well as you can for Canadians unless, regardless of the quantity you choose to export, you make sure you are on the US demand curve. The NEB always had their prices set at a quantity that essentially was under that demand curve. I think it's crucial to have guts when you face the export markets, especially in a bargaining situation. You have to be ready to say 'that's our reservation price. If you don't want to buy it you don't have to; we've got other things we can do with it.'

QUESTION: In terms of the pipeline decisions, a lot of your argument was that gas wasn't needed; it was going to be much too expensive. Subsequent events have proven basically that your price assumptions were much too pessimistic. Fortunately for your position another event occurred and the resulting high gas prices triggered a lot of discovery, creating the gas surplus.

My other comment is that I really fail to see the reason for using a 2 per cent discount on the benefits. You claim this is the real return being earned by the Heritage Fund. I would claim that it is a very poor measure for what the rates of return would be on any funds earned from these exports. There are a lot better opportunities than the short-term vehicles currently being used for reinvestment. If nothing else consider the various viable energy projects that will probably require a tremendous amount of capital. Therefore the real opportunity loss on forgoing revenues is much higher than 2 per cent.

I tend to agree with you that, although I don't think energy prices on an international scale will go down, they are probably limited on the up side, barring extreme circumstances. The main problem with maintaining high oil prices is basically to exercise control over the very vast resources in Saudi Arabia; if you took away that control and scattered those resources most people would agree that today's prices would fall. Barring catastrophic events in the Middle East, which are possible, the price of oil is held up to a certain degree, and therefore your resource-in-the-ground argument would really limit your appreciation on gas in the ground at the same time as you are forgoing much higher opportunity cost. Therefore I disagree with the 2 per cent discount.

J. HELLIWELL: As to being right for the wrong reason on prices, I don't think that is right because the analysis was all done, complete, and the facts were all in and the situation quite clear before the Iranian situation arose.

The basic argument was not that the pipeline wouldn't deliver gas from the Canadian Arctic at less than world oil prices post 1974 and pre 1979. The analysis was that there were Canadian sources other than Arctic gas that were lower cost by a large margin, and they were large enough to cover Canadian needs to the end of the century. Nothing that has happened in Iran changed that analysis or would change it. I would still do precisely the same analysis, the comparative cost argument. Naturally as to whether any amount of gas in the Arctic could be exported the economics have changed. But the argument was not made on the export case at all.

Rapporteur's Comments

A. Michael Spence

INTRODUCTION

It has been a privilege for me to read and hear the papers in this conference. They have been written by distinguished Canadian economists, and their very high quality reflects that fact. I commend them to anyone, particularly non-economists, interested in acquiring a working knowledge of Canada's energy resources, its future, and its problems.

The single strongest impression I have gained in the past month is that Canada is a country rich in energy resources. Ironically, the problems we have been considering seem in part to be created by a wealth of natural resources, rather than poverty. Taking natural gas and petroleum together, Canada is a net exporter. In petroleum by itself Canada supplied 65 per cent of its consumption of 700 million barrels in 1978 from domestic production. If the real price of petroleum continues to rise, with the right incentives it is conceivable that Canada could meet its own petroleum requirements in the future without subsidizing domestic production. The estimated reserves of natural gas (perhaps 147 trillion cubic feet) dwarf total domestic production to date and represent a huge source of wealth. Few countries are so well endowed, and as we face some difficult issues of pricing and wealth distribution we ought to remember how fortunate we are.

My second impression is that, by and large, Canada's energy resources have been well managed in a highly uncertain and chaotic environment. To be sure, one can point to past estimates of demand and supply and price that have been wide of the mark. But incentives to develop the resources have been provided and maintained by the provinces that manage them (principally the three most western provinces) and by the federal government. As a result, Canada finds itself with a wealthy, active, and, perhaps most important, knowledgeable energy sector. That knowledge itself represents a valuable intangible asset that will make a difficult energy future less uncertain and disruptive than it could have been. For this general state of affairs I think Canadians can and should feel pride in themselves and their governments.

The wealth bestowed upon the country is accompanied by certain international responsibilities to help especially those countries and peoples whose resources are more limited than ours, particularly in times of rapid change, disruption, and shortage. Some might disagree with this view. But I believe that taking a broad view of one's responsibilities not only is consistent with Canada's record of distinguished international citizenship but is also not inconsistent with a long-term assessment of our national interests. Indeed, Canada is a participant in the IEA agreement for allocating oil in times of shortage. Since oil is allocated to countries on the basis of their consumption, producing countries like Canada incur large percentage reductions in imports in times of shortage. That this is fair is, as far as I can see, accepted without complaint.

I feel that the broader international perspective is not only appropriate but also useful as an antidote to the potentially divisive internal issues that at times separate rather than unite Canadians. As we worry about who will benefit from the national wealth in the form of energy resources, it is helpful to remember that the vast majority of peoples do not have even the possibility of this debate.

Let me turn now to some of the central issues of energy policy.

CONSUMER PRICES

Canada is now a net importer of oil, although it is able to meet a substantial fraction of its requirements through domestic production. Because it is a net importer, the marginal cost of oil to Canada is equal to the current OPEC price. It has been proposed by many policy analysts that the consumer price of petroleum products, that is, the price that households and businesses pay for petroleum products, be raised to equal the current OPEC price. The case is eloquently argued here by Professor Waverman. The rationale for taking this step is that it is the best way to provide businesses and households with the correct incentive for undertaking investments and activities designed to reduce the consumption of petroleum to the extent that is consistent with the minimization of their costs or, in the case of households, their preferences. There is also, as I shall discuss below, a substantial question of what the appropriate rate of increase of consumer prices should be, given that the target is the current OPEC price of oil, or its future level if it should rise in nominal or real terms.

By the way, it is conceivable and even likely that a sufficient rise in the real price of petroleum products in international markets would both reduce domestic demand and increase domestic production enough to make them equal. Under those conditions it would no longer be true that the OPEC price of oil was the marginal cost of oil to consumers, and the appropriate price would be the marginal cost of oil in domestic production. I mention this here to emphasize that there is nothing magical about the world price of oil, except that at the moment it happens to be the marginal cost of oil to Canada.

COMPETITIVE CONSEQUENCES OF RAISING THE PRICES OF PETROLEUM PRODUCTS TO WORLD LEVELS

It has been argued, though not by the participants in this conference, that an increase in the price of petroleum products to world levels would make Canadian industries less competitive with respect to their international counterparts. It is also argued that the increase in the price of petroleum products would raise the cost in some industries much more than in other industries, with possible adverse competitive consequences. And sometimes in the same breath people worry about the investment in industry undertaken by the Alberta government as having adverse competitive consequences for industries in the rest of Canada. I want to spend a little time on this set of issues.

It is important not to confuse different aspects of the competitive consequences of raising the consumer price of oil. First, most of Canada's trading partners either have already incurred a cost-of-oil increase that corresponds to the rising OPEC price of oil and therefore have suffered, or are in process of suffering, the competitive consequences. Second, countries that have not incurred petroleum price increases corresponding to OPEC price increases, such as the United States, appear to be planning to move in that direction relatively soon. It is therefore not clear that, at least as far as international competition is concerned, raising Canada's consumer prices for petroleum products would result in any competitive disadvantage. Indeed, to the extent that the price has risen more rapidly in European and Southeast Asian countries, the situation is probably the reverse: those competitors have had their costs increased more than the Canadian industries have. The correct proposition is that if the price of petroleum products were to rise in Canada much more rapidly than the increases that are allowed in important trading partners, notably the United States, then there could be adverse competitive consequences. The appropriate policy conclusion is that the various governments involved ought to be cautious about raising the prices of petroleum products in this country quickly in comparison with those prices in our important trading partners.

The issue of the relative impact on different industries within the country and within regions of the country is quite a different one. It is true that industries that are more energy-intensive than others will tend as a result to have larger percentage increases in their unit costs than the others. It is also true that there may be demand shifts away from industries that have had large percentage increases in costs and prices towards industries that have had small percentage increases. The result may be that in the short run certain industries find their demand falling well short of their capacity, and unemployment or underemployment problems may arise in those industries. Finally, it is also true that since manufacturing industries are not distributed evenly across the country those effects may be felt in certain regions of Canada more than in others. All of that is quite distinct from suffering disadvantages vis-à-vis foreign competition.

The problem here is that changes in relative prices shift levels of demand and create employment problems in certain sectors. To the extent that these problems are serious a certain amount of gradualism in raising the relative prices of petroleum might be appropriate. My own view, and it is not one that I could support immediately with a mass of data, is that this problem will tend to arise in rather isolated and special circumstances. That is to say, there will be a select subset of industries which have serious problems with price increases and falling demand, but the majority of industries will not find the effects terribly serious, compared to the effects suffered in a recession. Therefore, from my point of view a preferred strategy would be to devote special attention to the industries that are adversely affected, possibly subsidizing the purchase of petroleum-based inputs on a declining basis over time, so that the adjustment does not have to be made too suddenly. That would be better than holding petroleum prices low across the board.

Finally, let me turn to the question of allocating petroleum revenues in the producing provinces. Should they be used to develop industry in those provinces? Alberta's investing heavily in its own manufacturing sector may divert growth from manufacturing sectors in other parts of Canada. That, it seems to me, is not by itself a particularly bad thing, although it may not appeal to businesses in other parts of Canada that were looking forward to stronger growth than would perhaps be possible in that case. What would be unfortunate is if, in the course of investing in the development of local manufacturing, the producing provinces were to subsidize it as well. That policy could produce serious competitive consequences for industries in other parts of Canada, and on both efficiency and equity grounds is to be avoided.

PRODUCER PRICES FOR ENERGY AND THE MAINTENANCE OF INCENTIVES FOR EFFICIENT PRODUCTION

Just as the level of the consumer price of petroleum products has efficiency implications for the decisions that households and businesses make about the consuming of various energy products, the setting of producer prices also has efficiency implications for the development of energy resources. The returns enjoyed by producers of petroleum and natural gas in Canada are determined by a very complicated set of royalties imposed by the producing provinces as well as by income and excise taxes, by the subsidies built into the federal tax system, and by the mechanisms through which the producing provinces allocate among producers the potential reserves within their boundaries. This is no place to try to disentangle the complicated and very interesting set of taxes and resource allocation mechanisms. However, the issue at the heart of the policy debate on the subject can be stated quite simply. In order to have the most efficient amount of domestic production in Canada, those energy resources that can be produced at a unit cost below the price consumers are paying for the products ought to be produced. The simplest way of achieving that is to make the producer price equal to the consumer price. If that were done, then any reserve or tract that could be developed at a unit cost lying below the consumer price would in fact be developed and supplied to the domestic market. The problem with setting the producer price equal to the consumer price is that the vast majority of the current reserves of petroleum have unit costs of production well below the current and proposed consumer prices. Therefore, if the producer price were simply set equal to the consumer price the profits (or, as they are sometimes called, rents) which would accrue to the producers of petroleum products would be enormous. And the rents accruing to the provinces that own the resources would be minimal.

In principle there are several ways to deal with this problem. One way is to have a set of royalty charges which diminish as the unit costs of the particular well or reserve increase. That kind of system has the effect of extracting at least some of the rents from the low-cost reserves while not having such high charges on the high-cost reserves, that it is uneconomic to produce from them. Professor Waverman has noted that a system of uniform royalties has unfortunate incentive consequences of the type just described. A simple royalty lowers the producer price below the consumer price by the amount of the royalty, therefore removing the incentive to produce from marginal reserves.

Several commentators have noted, however, that the current system is sufficiently flexible to allow for a negotiated set of reduced royalties for those reserves, tracts and wells that the producers and the provinces owning the resources agree are the high-cost sources. Professor Waverman proposed that a simpler mechanism might be an income tax or profits tax. He acknowledged that such a tax would require knowledge of costs, which in principle a simple royalty system does not require. The current royalty system, which is rather more flexible than a simple uniform royalty on all petroleum production, does require some sophisticated knowledge of cost in order to be implemented effectively. The problem I see with the income tax proposal is that if one sets as a goal the recovery of approximately the level of revenues now recovered by the producing provinces and the federal government from the current system of royalties, I suspect the income tax would be sufficiently high to provide a significant negative incentive, from the point of view of profitability in exploring and developing marginal reserves. The extent of that disincentive would depend on precisely what the required corporate tax rate would be, and I do not have the numbers at my disposal immediately to calculate that. But if, as seems to be the case, there are significiant bodies of relatively low-cost oil reserves, the income tax required to extract the rents from those reserves could be very high and would therefore arguably provide a disincentive with respect to the development of new tracts by removing a substantial fraction of the profit. That disincentive would be reduced if the taxing authorities, either provincial or federal, were prepared to match the heavy proportional taxes on profits with a comparably heavy proportional subsidy on losses. But then one would be back in the position of having to know something about the costs of the producers.

Professor Hartle made a number of very interesting proposals with respect to the extraction and distribution of rents. His suggestions amount to a set of excise taxes sensitive to the unit costs of production. I agree in part with Professor Hartle on what the appropriate way of extracting rents is. But I would rather have Alberta setting the taxes. In addition, I want to comment briefly on his argument that the depletion allowances have had adverse consequences. The depletion allowance system built into the federal tax law enables the allowance to be charged against resource income in most cases. There is a special kind of depletion allowance for which this is not true, but that need not detain us here. The effect is that the depletion allowance is more valuable to a firm that already has resource revenues than to one without them. This, it is argued, erects a barrier to entry for new firms, which at least initially would not have resource income. However, since a new entrant into the petroleum or natural gas industry may accumulate depletion allowance credits based on exploration and development to be applied against future resource income, the entry barrier problem is substantially taken care of. What remains is the benefit that the existing producer could derive from charging the depletion allowance against current income rather than future income. That benefit would be proportional to the time the new entrant would need before receiving income against which to charge the depletion allowance for tax purposes, and hence would depend on the relevant interest rates.

The other point Professor Hartle made is that depletion allowances tend to get capitalized in the land values, transforming what would have been revenues to the federal government into revenues to the provincial government. I have no quarrel with that proposition generally, provided it is understood that the depletion allowance is intended, or was to some extent designed, to transform uneconomic reserves into economic ones. In the course of doing that the allowance may very well raise the price of a tract that is otherwise uneconomic from zero to something positive, but at least it makes the tract economic to develop. I therefore cannot subscribe to the simple proposition that the only effect of the depletion allowance in the federal tax structure is to transfer rents from the federal and provincial governments. I say this without attempting to prejudge or fully analyse the question whether depletion allowances are a particularly efficient way of bringing on marginal production.

My over-all impression from the debate on this subject is to extract rents and maintain incentives in the production of high-cost petroleum and natural gas some system like the current one, which is flexible and allows the low-cost wells and tracts to be taxed at higher rates than the high-cost wells, is about right. It lacks the elegance of some of the simpler schemes economists tend to prefer, and it is open to abuses like discriminatory contracts. But such abuses have been avoided and will be avoided by maintaining very high standards of fairness and equity in the management of the natural resources. The effective employment of such a flexible system requires that the public sector managers of the resource be extremely knowledgeable about the production technology of the industry. It is important that the resources be managed on the public sector side by those who are not at a significant informational disadvantage to their private sector counterparts. I shall comment briefly on this point later.

THE DISTRIBUTION OF RENTS AND THE ECONOMIC CONSEQUENCES

Tom Wilson, in his very informative introduction to the conference, remarked that he was sure that we were as uncomfortable with back-of-the-envelope calculations as he is. I winced, because although I agree that careful quantitative macroeconomic analyses of the consequences of oil price increase are desirable I do want to make some cruder calculations of the consequences of price rises and rent distribution schemes.

Two things need to be said at the outset. One is that the most divisive issue in energy policy is, not surprisingly, who will get what fraction of the rents that derive from the use of resources to produce petroleum. The second is that the macroeconomic consequences of oil price increases cannot be disentangled from the distribution of rents. I should like to devote most of my remarks to that linkage.

The recipients of rents are the producing countries, the producing companies (or their shareholders), the governments of the producing provinces, and the federal government. In round numbers the current price of crude petroleum is $14 and the world price is $24. In 1978 Canadian consumption was 700 million barrels. A price rise of $10 to world levels would generate $7 billion in rents. The countries from which Canada buys imports would get $2.4 billion. It is estimated that the producing companies would get $2 billion, Alberta would get $2 billion, and the federal government $0.6 billion under current royalty systems.[1] All of the figures are per annum. Producing company assets are 80 to 85 per cent foreign-owned. Therefore, as with the producing countries, those rents would go to non-residents. Changes in the taxes and royalties would obviously change these numbers, though there are complexities associated with the taxation of dividends and related matters.

If Alberta saves and invests its portion of the rents, so that in the short run those rents are removed from the system, the effect of a $10 increase in crude oil would be to reduce the disposable income of Canadians by $6.4 billion, or roughly 2.7 per cent of GNP.

Correspondingly, incomes would fall by $6.4 billion in real terms. The price rise would show up in the consumer price increase. There would be pressure to raise wages and salaries, and that would be inflationary. The loss of wealth and income of $6.4 billion a year would reduce aggregate demand. A rough estimate of the effect on unemployment would be a short-run increase in the unemployment rate of 1.3 percentage points.

The federal government could blunt the short-run effect on income and demand by cutting taxes by $6.4 billion, financing the resulting deficit with bonds. That would transform the lost current income into a stream of future interest payments (to be paid out of taxes) representing lost future income. Deficit financing of these losses could not be sustained forever.

The residents of the producing provinces, present and future, would benefit by having future reductions in taxes equal to the interest payments on the $2 billion that the provincial government invested on their behalf. In this context, it does not matter whether the Alberta government lends to the federal government directly or indirectly through the bond markets. The effect is to transform a current income transfer of $2 billion into a stream of future payments.

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[1] Actually the share going to producing companies was variously estimated at the conference to lie between $1 and $2 billion. That is an unacceptably large range. It ought to be possible to refine the calculations.

If the federal government were to appropriate the entire $7 billion in rents, it could cut taxes elsewhere by $7 billion; government budgets would be as before. Disposable income would be unchanged. In the longer run, consumers would benefit as they substituted away from high-cost energy.

However, even if the federal government got all the $7 billion in rents as described above, the consumer price index would rise, and there would be inflationary pressure. Unfortunately, people look at wages and not incomes after taxes to see how they are doing. I have semi-seriously suggested removing energy prices from the CPI on the ground that the CPI is, in Professor Dupré's terms, one of those highly political numbers that can on occasion mislead as much as it informs.

The actual macroeconomic consequences of oil price increases are of course much more complicated than this simple analysis suggests. But the point remains. A price increase of $10 a barrel, with rents not appropriated by the federal government, has the effect of lowering the real incomes of consumers outside producing provinces by about $6 billion. The loss can be stretched out over time by deficit financing, but that does not change its size. The situation is analogous to the effect of a crude oil price rise on a country with no production. Real incomes fall, inflation rises, and some of the loss is stretched out over time by individual and government borrowing part of which is financed by the lending of the rents collected by petroleum producers.

The producing provinces could save by investing in new real assets like manufacturing. That would partially restore real incomes and aggregate demand, and to the extent that rents are appropriated by the producing provinces it would perhaps be the best strategy. Its attractiveness, however, depends on the ability of the producing provinces to find investments that do not displace private sector investment. What we need is new investment, not a substitution of one kind of investment for another.

The questions of who should have the rents and what should be done with them are at the heart of the current policy debate. They are emotional issues, and it would be presumptuous of me to make precise pronouncements on them. I do think that the rents generated by price increases should be divided between the producing provinces and the federal government somewhat more evenly than the current system would indicate. I would also argue that the federal government, representing all the citizens of the country, should not commit itself to price increases in advance of specific negotiations about the disposition of the revenues. Price increases should be contingent on finding an acceptable method of distributing the benefits.

It is ironic that a country with no domestic production can probably allow the consumer price to rise to world levels quickly. It may even avoid the inflationary consequences to some extent by having its citizens note that if real incomes have all fallen as a result at least they are all in it together. In a producing country some of the loss to consumers goes to other citizens, and that is what creates the ultimate political problem in raising consumer prices.

As to the speed with which price changes should be made, on balance I prefer the firm but moderate approach. The decision to raise prices should be taken soon and then implemented, but not overnight. Three to four years seems to me an appropriate target date for reaching world price levels. Admittedly, the inflationary impact may be more serious with the gradual approach, but a controlled approach that is in line with U.S. policy and gives people and firms time to invest in energy conservation measures is to be preferred.

EQUALIZATION AND DISTRIBUTIONAL ISSUES

Some very useful work has been done by the participants in the energy conference on the more detailed aspects of distribution questions. The papers by Professors Waverman and Courchene shed considerable empirical light on various aspects of distributional issues.

Waverman, using data provided by Statistics Canada and the input/output table for the country, calculated what effect an increase in petroleum prices would have on the direct and indirect consumption of energy by people in various income classes in Canada. This exercise was to determine whether, taking all things into account, the fraction of the consumer's budget in various income classes going to energy products, either directly or indirectly, increases or decreases with the level of income. The answer is that on average across income classes it is roughly constant. A slightly more refined summary of his results is that the ratio of energy expenditures to total expenditures within income classes would be a mildly U-shaped function of income itself. This means that an increase in energy prices is, roughly speaking, a neutral tax, neither regressive nor progressive. Considering only direct expenditures it is to some extent a regressive tax, but of course that is not the appropriate standard. The only point I would add to Professor Waverman's analysis is that before going ahead and making policy on the basis of such calculations I would like to see some analysis of the distribution of expenditures on energy as a percentage of income within income classes. Perhaps there are certain people who, because of where they live or the kinds of work they do, have higher energy expenditures as a fraction of income than the average for their class. Before policy is made, it would be useful to know something about what those distributions look like. Nevertheless, I am inclined to agree, on the basis of Professor Waverman's analysis, with his conclusion that holding prices of energy down purely to protect those consumers who may be disadvantaged by such a change would be not only a poor energy policy but probably a very poor welfare policy as well.

Professor Courchene has analysed lucidly and carefully the interprovincial equalization payment system. I do not pretend to be an expert on this subject. Indeed, everything I know about it I have learned from Professor Courchene. The issue he raised concerns the extent to which the interprovincial equalization payment system compensates for differences in the revenues and costs of energy among provinces. Very roughly speaking the answer appears to be this: the equalization system causes transfers of income from the relatively richer, non-petroleum-producing provinces like Ontario to the relatively poorer non-petroleum-producing provinces like Quebec and (although this is quickly becoming a historical matter) the Maritimes. A small fraction of the transfers to the relatively poorer non-producing provinces comes from the producing provinces, largely through the federal income taxation system. By and large, because the revenues that result from gas and oil production are not themselves redistributed by the equalization system, the transfers of income from the producing provinces to the non-producing provinces are limited. Indeed, if the producing provinces had relatively low per capita incomes (this is not now the case, but it is possible) then the transfers under the equalization system as a result of high energy resource income from the producing provinces would be negligible.

There are other distributional issues. Professor Waverman's calculations indicate significant differences across manufacturing industries in the extent of the impact of petroleum price increases on cost. The regional effects of petroleum price increases are not especially large except for the transfer of income from the non-producing provinces to the producing provinces and to the other people who benefit from the rents or resource income.

There may be people of lower incomes who are adversely affected by rapid and large rises in energy prices. If that turns out to be the case, these people must be protected by transfers from the public sector to compensate them for these price changes. Assuming that is done and on a timely basis, the potential for their being a burden on low-income people should not be the occasion for holding down the entire price structure of energy products into the indefinite future. Secondly, there exists no mechanism for distributing to the non-producing provinces the rents that accrue to the producing provinces. The aggregate volume of these rents is large, and they are large on a per capita basis in the producing provinces. On a per capita basis in the non-producing provinces the effects are not trivial, but they are not much different than the effects of a recession.

Finally, I cannot help drawing the reader's attention once again to the perceptive and important remarks made by Professor Dupré in response to Professor Courchene's equalization discussion. Without restating all Dupré's points, it seems to me that the principal distributional consequences, apart from the macroeconomic ones discussed earlier, are essentially political. It would be unfortunate in the extreme if an uncompensated rise in the prices of natural resources were to be the occasion for renewed claims that there are first-/and second-class citizens depending on the province in which they live.

THE GOVERNMENT-OWNED PETROLEUM COMPANY

I have noted with interest that our conference has included no reference to PetroCan. Its status as a public corporation is currently a matter of some debate, and although it has not been dealt with explicitly here perhaps I may be permitted one or two comments on it. The existence of a government-owned petroleum company seems to me to be very useful for at least three reasons. First, because it is government-owned, some of the rents that accrue to producing companies therefore accrue to the government. Second, the knowledge that is acquired, and perhaps can only be acquired, by doing business in the industry is useful to government in developing its policies, its forecasts, and its plans. Provided PetroCan is run efficiently and on the basis of generally accepted business principles, its existence provides a spillover benefit to the public sector in the form of information of a detailed kind available in other countries in only the private sector. Third, the credibility bestowed on the public sector by virtue of having a presence in the private sector should not be underestimated. Moreover, on occasions when private sector companies have been called upon to speak for themselves in such matters as supply, profits, and allocations it has turned out, at least in the United States, to be very difficult for them to speak credibly on their own behalf. They are suspected of self-serving motives . Here too the ability of the public sector to speak with the authority of a participant on behalf of the industry would be useful.

Professor Helliwell has discussed convincingly some of the problems of conflict of interest and confusion that develop when there is a proliferation of government roles in the private resource sector. Having a government-owned company in the natural resource area would complicate the relationship between the industry and the government in so far as that industry continued to be heavily regulated. Nevertheless, based on the performance of PetroCan and the arguments mentioned above, it seems to me that the balance tilts in favour of having a public presence in the producing sector.

EDUCATION

I have reserved my final remarks for a subject that I think is extremely important but has not been discussed at great length in the conference itself. Having observed the debate over energy policy in a number of countries, including the United States and Canada, I believe that while the resource allocation issues are tremendously important in themselves a crucial part of developing energy policy is public eduction. I recently talked with one of the leading US poll-takers on the subject of the public's knowledge of various issues in the public arena. By far the worst marks were garnered in the area of energy policy and problems. The level of misunderstanding of what the problems are, and what the implications of various possible solutions are, cannot be overestimated. Energy policy calls for statesmanship among national leaders that is not normally required in dealing even with difficult national issues.

It is tremendously difficult for the citizens of a country to understand a commodity that is priced at something like ten times its cost of production. The cost of consuming non-renewable natural resources now is that they are not available for consumption tomorrow, or the next day, or next year. The pricing of those products is designed to allocate those scarce resources over time, and the prices frequently bear little or no relationship to the actual cost of extracting the resource from the ground. Neither the relationship between the prices and costs nor the enormous rents that are generated are easy for the average person to understand. It is important for policy-makers, legislators, members of the industry, economists, and other interested analysts to meet and discuss the problems with each other at a fairly technical level and to come to some degree of understanding. But it is equally important in the long run that citizens who are not involved in the day-to-day debate at anything like the same level of detail should come to understand the basic problems the country faces and the choices being made.

The experience of the United States, which in many respects has been much less informative than Canadian experience to date, indicates clearly that under circumstances of adversity, when there are shortages, large changes in prices, and large profits, the scope for suspicion, disillusionment, and alienation is very wide. Some of the investments needed to develop the higher-cost energy resources will be very risky indeed. The failures tend afterwards to disappear from view, and the successes often have very high returns associated with them. It is very easy to forget that the high returns were the investors' compensation for taking the high risk. They all too frequently are regarded simply as excessive profits being taken by the producers. This is another example of the problem of public understanding that faces politicians, governments, and industries in developing and implementing an effective energy policy.

To me, energy is a national challenge. It is a challenge to the political leaders of the country to bring to bear as much influence as they can on the long-run educational process. In meeting the challenge they require the support not only of the provincial governments and the industries involved, but also of the press and the academic community. For in the end, I believe, the success of a national policy in an area like energy depends critically on the ability of the citizens to understand the whole of the problem, and not just that part of it which affects their particular interests, daily lives, and incomes.

Discussion

QUESTION: It seems to me Mike Spence has summarized very well the central issues of the conference. Four related issues strike me as especially important and I would like to see whether Professor Spence is willing to defend what I shall suggest as his possible conclusions. They may be a little more specific than he wants to put them.

First of all, on the efficiency issue, a higher price for oil in Canada is desirable.

Secondly, on the distribution issue, that problem is exaggerated and not nearly as serious as perhaps it is normally regarded.

Thirdly, because of the effect this would have on price stability and employment levels it would be best to go a little more slowly than efficiency would suggest, to stretch the process out a little more so the system can adjust. But efficiency is still the important criterion.

Finally, on political decision-making, Canadian governments are liberal decision-making units, and we must recognize what forces affect them. That will slow things up even further perhaps, but there is no tremendous political constraint in Canada, much as we may worry about our diversity.

Is that a fair summary?

MICHAEL SPENCE: A fair question. I tried to avoid answering it, but I will now.

I am in favour of raising the consumer price. But if I were in the cabinet I would not commit myself to doing that before settling some of the distribution issues.

It seems to me that the price of crude oil ought to be one of the things you use strategically. I say this with some hesitation, but it seems to me that the federal government, representing all Canadians, has to consider who gets what, and maximizing the size of the pie before deciding who gets what part of it may not be the way to proceed.

I detect a drift in the policy debate along the following lines: efficiency says consumer price has to be higher; that generates a lot of rents; who is going to get them? And now we have what looks like a zero-sum game.

Secondly, I don't think it is wise for the federal government to commit itself to raising prices in the abstract without some sort of commitment on what the dispersion of the rents generated might be.

I defer to the experts on the question of macroeconomic effects. My comments here are really designed to let the non-macroeconomist think it through.

Other than the strategic issue, which I think is at the heart of what we have been talking about, I agree basically with what you have said.

QUESTION: I am intrigued by one thing you said near the end of your talk concerning the scepticism of the consumer. You were talking particularly of the United States. I wonder if that scepticism is really the issue or is it a problem of the President not being able to get anything passed through Congress?

MICHAEL SPENCE: I will give you a personal view on that. I think the current administration in the United States has been guilty of blaming almost every party in sight, from OPEC to the oil companies to the lobbyists and the Congress for their inactivity, and that primarily has been the source of the confusion among the American public.

It is also true that Congress has, as a result of presidential abuses in the past, asserted itself, and it now holds up things that it would otherwise pass.

There is no question that the consumer and the whole private sector in the United States is disillusioned, and I think in a state of depression about our inability to have a coherent energy policy. Until recently, all we had was an increase in the price of natural gas.

There has been a failure on the part of the people who have the ear of the public to explain in simple understandable terms what the problem is.

The whole question arose in 1973. We had conspiracy theories. Some were convinced this was an oil company plot, a temporary shutoff, designed to eliminate independent gasoline retailers.

The problem is now better understood. One could hardly miss the fact that Iran was producing 5 million barrels a day, and went down to zero.

It is not a simple issue, and you correctly perceived there is a serious problem in the United States, but I think it is a public education problem.

QUESTION: What do you do with the leaders misleading the public? Richard Nixon promised self-sufficiency by 1980.

I read the other day the annual report of the Mobil Oil Company for 1972 in which the President of Mobil argued it was wrong for people to assume energy conservation and restraint on consumption because it would deprive people who are still poor of the opportunity to share the riches of the country.

MICHAEL SPENCE: The only thing I can say by way of justification is that everyone was tremendously confused about basic things. There was a tremendous debate. We were functioning in a world that had $3 oil, and all of a sudden the price began rising. What was the right price? We started out thinking the old price was right, that this was an ordinary nasty cartel, for which, if it were a domestic cartel, we would have had anti-trust laws.

After three years the conventional wisdom was that the new price was right and the old price was the subsidized one. That was the transition in everybody's thinking.

There may have been voices in the wilderness in 1972 saying oil was underpriced but not many.

I am inclined to take a sympathetic attitude towards the people who were wrestling with the problem at the time, because it was tremendously wrenching and confusing.

COMMENT: Given that the government and industry never had credibility in the recent past with the general public, the scientific community has lost it as a result of Three Mile Island. The only remaining group that has any public credibility at all is the academic world. I think it does impose a considerable responsibility upon a large number of people here today, that the pronouncements they make must be astute and well thought out, so that they will be perceived as true by the public.

Secondly, there has been a distinct absence of the perspective of the consumer in the proceedings of this conference. The orientation has been very much to the supplier and to the export of primary energy resources. I think there is another dimension, particularly if one considers the possibility that Canada may become energy self-sufficient in the foreseeable future. Canada's position could be enviable among the trading nations of the world. It would be extremely unfortunate if we reached year 2000 and were energy self-sufficient with all its advantages to our industrial economy and find that we priced ourselves out of the market in the 1980s.

To draw a case in point, I heard today that Canada's exports of electric power in 1978 were $479 million, a positive contribution to the balance of payments. On the other hand the fabricated plastics industry in 1978 had a net deficit in balance of payments of $480 million. That industry depends on natural gas or petroleum for feedstocks and on electric power for operating energy, both of which Canada is blessed in. And its performance is now the worst in the world. We should direct as much effort to studying how we can properly manage energy consumption in Canada as we do to the producing and exporting of primary power.

MICHAEL SPENCE: That is a very useful set of comments. Let me agree with the first one. I have no idea whether academics have any credibility or not. My lawyer friends assure me that you can find an economist to say anything.

On the question of competitiveness (I hope I am not risking overgeneralization) the conclusion I draw from what you say is that at least in the case of one industry, by raising our costs inappropriately relative to the competition, we have simply made a mistake.

I think the operating principle should be that, industry by industry, we do not engage in administered changes in relative prices that put those industries at a disadvantage on a cost basis.

I have a kind of bias here. I would rather that that kind of decision were made in the context of a coherent industrial strategy, which I don't think we have at the moment. We have bits and pieces, but we do not have a coherent direction.

In lieu of that, it seems to me the simplest principle is to ensure that we not get non-competitive with respect to our trading partners.

In the case of energy, provided we don't go too quickly ahead of the

United States, we are unlikely to get ourselves into serious cost trouble, because most countries face the higher energy prices as soon as they occur. Where that is not true, my attitude is that we should back off and think about it.

I think the problems that result from administered price changes are short run and can be cushioned with temporary subsidies.

Energy prices and many other things are levers that other countries use as competitive weapons. We in Canada and the United States tend not to use those weapons competitively; it may be a mistake. There are some battles to be won and lost at the industry level. It doesn't take much of a cost difference to lose a hell of a lot of market share.

If the Japanese are making steel with subsidized energy, I am not sure we shouldn't be doing the same thing or raising the tariffs.

COMMENT: You were talking about using energy as a competitive tool, country to country, but I think this is really what we have in Canada, except it is province to province.

What Ontario I think is concerned about is that the solution to energy is in the hands of the politicians; we are now into a political situation.

We can wax eloquent about marginal costs and marginal benefits, but what is essentially at stake is the eroding of Ontario's position as the kingpin of Canada. The economic capital of Canada is moving west.

Now, how do we accommodate that?

As I should have said earlier this morning, one of the main things holding this country together is that the Toronto Argonauts have never won the Grey Cup.

What has happened is that Ontario has agreed in essence to pay for some equalization payments, allowing Alberta to pocket those revenues. Then Alberta takes the Heritage Fund, and if it invested these funds at market rates I think we could all be quite satisfied. But it is not doing that; the purpose of the Heritage Fund is to develop Alberta. The Heritage Fund can be used to attract industry away from Ontario.

We are in a state of economic warfare.

COMMENT: The paper by Powrie and Scarfe in fact tries to outline the Alberta position on the Heritage Savings Trust Fund, and I hope everyone will read that for what it is worth.

I want to raise a question about the sharing of resources, a question germane to this conference.

John Helliwell has told us that the Hartle view and the Powrie view of the sharing of resource rents amount in cash dollar terms to the same thing. I think that is in fact a false view of the situation.

Alberta is concerned not just about the ownership of those resources but also about the control of those resources.

Hartle's scheme of suggesting that the federal government should impose an excise tax and rebate some of those revenues to Alberta to that province to roll back its royalties to the level of 1973 is a view that the government of Alberta will not accept.

The Powrie view on the other hand is that if we treated the resource rents as if they were in the private sector and they were guarded by the province of Alberta, some portion of them should be remitted to Ottawa for redistribution across Canada. Such a mechanism would share the ownership of those resources, but in fact would leave control over the management of those resources and the right to impose any tax or royalty thought to be appropriate with the province of Alberta.

There is an important tradeoff here between ownership and control. If Premier Lougheed is allowed to control those resources he may in fact concede a lot on the question of sharing ownership of them. But the Hartle strategy of trying to take the ownership of resources away will in fact cause an unbelievable constitutional problem.

I am suggesting the view originally expressed by Scott, who suggested that the provincial governments should be the stewards and bailiffs of our resources; they should be our rent collectors. They should not necessarily act as the owners of those resources but should serve a managerial function.

So, we should go the Powrie route of sharing resource ownership even though there are constitutional problems with it, rather than the Hartle route of rolling back Alberta's resource rentals and ownership to the federal government.

COMMENT: This conference is imbalanced in the sense that the question has been focused on Ontario against Alberta. As a Canadian first and a Newfoundlander second, it frightens me to see the dichotomy of views between Ontario and Alberta.

The greatest rape in the economic history of Canada has got to be the Upper Churchill Power developmemnt. Newfoundland today draws, as was pointed out, an equalization payment of some $348 million a year. Hydro makes $365 million a year off the Upper Churchill. Where is the economic justice in confederation?

COMMENT: There is a problem with Newfoundland in equalization payments in respect to hydro power. For most resources the tax base is in terms of dollars, but when it comes to hydro power the tax base is in terms of output. And Newfoundland, because of Churchill Falls, is viewed as a 'have province' for equalization payments even though it sold its birthright to Quebec.

QUESTION: I think Mr Spence is too sanguine about the international oil companies. The way those groups have behaved as pressure groups in this country is not quite as straightforward and simple as you think.

The fact your friends are very decent fellows has nothing to do with the way they behave when they are fighting for their interests.

Secondly, it seems to me that to pretend the price has to go up to allow the firms to get the rate of return is a very expensive way of exploring on the margin. I think there must be a cheaper way than leaving the tax system as is.

On the question of ownership and control, I find that a distinction without a difference. Ownership is always controlled or limited, and what is the point of having ownership if you have no control. The ideal thing, I believe, is that natural resource revenues should be taxed at essentially the corporate tax rate. It may only be a second- or tenth-best solution, but it is wrong to contend that those resources shouldn't be taxed at all.

MICHAEL SPENCE: Your main point, Doug, was that these are inefficient ways to provide the incentives, and I was only objecting to your assertion about capitalization.

On the multinationals I don't know what to say except my perception is different than yours.

COMMENT: I am not an expert in these matters, but if you have been at cabinet meetings, and seen the way these groups behave and how they get at politicians, to suggest this is like any other industry is a great mistake.

Financial Intermediation and its Implications for the Recycling Problem

Peter A. T. Campbell

INTRODUCTION

The scope of this paper is limited to the Canadian capital market and the perceived financial recycling problem pursuant to emergent developments in the energy business in Canada. My viewpoint is from the financial market trenches of a fully integrated Canadian investment dealer.

SUMMARY AND CONCLUSION

There is no recycling problem at the present time. It is highly unlikely that there will be a recycling problem in the meaningful future.

ORDERS OF MAGNITUDE

Table 1 is a proxy for the demand side of the Canadian capital market. Table 2 presents an order of magnitude for the money market. Table 3 is a proxy for the supply side of the Canadian capital market. Table 4 reflects the volume of activity in the secondary fixed-income markets in Canada. Table 5 reflects the volume of activity in the secondary equity markets in Canada.

GENERAL

In general, the institutional and corporate sector of the Canadian capital market is professionally managed. All available funds are therefore continuously invested. To the extent that funds are not fully invested from time to time, the cause would normally be accounting mishaps that failed to identify the availability of funds.

Members of the Investment Dealers Association of Canada account for almost all the activity in the secondary market-making function. To smooth out discrepancies between inflows and outflows of funds from the institutional sector, investment dealers have daylight or intra-day overdraft facilities with Canadian banks. These facilities act as a surge tank during each business day as the institutional sector works towards a flat or zero funds position by the close of business each day.

Given the manner in which the Canadian capital market works on a day-to-day basis, it would seem that the recycling question is probably a non-question at least in concept. From a practical or operational point of view, there would appear to be three questions worthy of consideration. First, what happens if particular elements become too large for the system? Second, do rigidities emerge if key major lenders have restricted approved investment lists? And, third, does the emergence of major lenders restrain the financial intermediation process? It might be useful to examine these questions in the context of specific major lenders wherever possible. Two are selected, the Alberta Heritage Savings Trust Fund and the Caisse dépôt et placements du Quebec.

THE QUESTION OF SIZE

From an asset point of view and keeping the numbers round, both the Caisse and the Alberta Heritage Fund increased their assets by about $1.5 billion in 1978. These amounts relate to the $50 billion in gross financing in 1978 (Table 1), the increase in size of the Canadian money market by $15 billion in 1978 (Table 2), and the increase in the institutional lending sector by $43 billion in 1978 (Table 3).

From a cash-flow point of view, both new funds and proceeds of past investments, a useful perspective can be attained by examining transaction volume statistics. There are approximately 250 meaningful business days in each year. The daily average investment of new funds by both the Caisse and the Heritage Fund is, therefore, about $6 million. This compares to the daily average turnover in the various markets handled by members of the IDA and the stock exchanges of $932 million in 1978 (Tables 4 and 5). In addition, there could easily be almost that volume being handled by the banks and near-banks directly in the primary fixed-deposit markets.

In the event that there is lumpiness in the receipt of funds either new or from proceeds of past investments, professionally managed institutions phase the term structure of their portfolios to smooth out discontinuities.

TABLE 1

Gross financing by selected Canadian borrowers ($ million)

	1975	%	1976	%	1977	%	1978	%	1978	%	1979	%
Government sector												
Canada	6,129	19.7	6,137	17.3	8,562	20.2	15,569	30.8	3,673	18.3	4,917	25.7
Provinces	7,963	25.6	10,085	28.5	8,453	20.0	8,226	16.3	4,560	22.7	4,687	24.5
Municipalities	1,415	4.6	1,596	4.5	1,540	3.6	1,038	2.1	521	2.6	563	2.9
Total governments	15,507	49.9	17,818	50.3	18,555	43.8	24,824	49.1	8,754	43.6	10,167	53.2
Corporate sector												
Debt	4,027	13.0	5,400	15.3	5,960	14.1	5,289	10.5	2,729	13.6	2,328	12.2
Equity	1,310	4.2	1,346	3.8	2,829	6.7	6,287	12.4	2,032	10.1	1,717	9.0
Total corporate	5,337	17.2	6,746	19.1	8,789	20.8	11,576	22.9	4,761	23.7	4,047	21.2
Mortgage sector												
Residential mortgage	10,206	32.9	10,840	30.6	14,973	35.4	14,121	28.0	6,574	32.7	4,898*	25.6
Grand total	31,050	100.0	35,404	100.0	42,317	100.0	50,521	100.0	20,089	100.0	19,110	100.0

*Wood Gundy estimate

Source: Bank of Canada Review

TABLE 2

Canadian money market by asset category ($ million Can.)

	May 1979	December 1978	December 1977	December 1976	December 1975	December 1974	December 1973	December 1972	December 1971
1. Government of Canada									
- Treasury Bills	13,835	13,135	10,315	7,845	6,200	5,630	4,690	4,160	3,830
- Other, less than 3 years	8,892	7,774	7,729	7,011	6,957	6,325	5,699	5,856	5,300
2. Provincial & Municipal Notes	815(a)	637	448	556	774	462	536	603	529
3. Bankers' Acceptance	2,100	1,664	1,166	1,135	1,047	903	342	390	403
4. Chartered Banks:									
- Corporate Deposit	31,382	26,911	22,541	18,887	14,517	11,770	9,686	8,265	6,375
- Swapped Deposits	1,704	1,538	1,545	1,281	848	1,787	880	270	758
- Other foreign currency deposits with Canadian residents booked in Canada	10,514	9,857	5,845	5,403	3,528	3,255	2,022	1,206	1,206
5. Trust & Mortgage Loan Co. (-1 year)	3,688(b)	3,436	2,462	2,108	1,824	2,381	1,837	1,472(c)	1,063
6. Commercial Paper including Sales Finance Co. Paper	10,895(d)	9,670	7,908	7,147	6,077	5,927	3,705	2,820	2,594
	83,825	74,622	59,959	51,373	41,772	38,440	29,397	25,042	21,782

TABLE 2 (continued)

Canadian money market by asset category ($ million Can.)

	May 1979	December 1978	December 1977	December 1976	December 1975	December 1974	December 1973	December 1972	December 1971
Rate of Growth	29.6%(e)	24.5%	16.7%	23.0%	8.7%	30.8%	17.4%	15.0%	4.5%
Official Money Market	22,727	20,909	18,044	14,856	13,157	11,955	10,389	10,016	9,130
Private Money Market	61,098	53,713	41,915	36,517	28,615	26,485	19,008	15,026	12,652

(a) April
(b) March
(c) New series beginning 1972
(d) Estimate
(e) Annualized

Source: Bank of Canada Review

TABLE 3

Institutional lending structure of Canadian capital markets ($ million)

Institutions	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978
Chartered banks (Canadian dollars assets)	28,940	31,000	33,616	39,958	46,650	56,455	68,481	77,169	88,790	102,819	122,218
Trust and mortgage loan companies	7,985	9,063	10,343	11,629	13,381	16,466	19,185	22,621	27,667	32,633	38,389
Life insurance companies	13,373	13,914	14,622	15,544	17,027	18,604	20,072	22,300	24,576	28,057	30,704
Trusteed pension plans	8,923	9,950	11,011	12,461	14,004	15,933	18,075	20,917	24,118	29,041	34,118
Credit unions and caisse populaires	3,758	4,103	4,570	5,532	7,040	8,814	10,315	12,791	15,692	19,618	23,976
Financial corporations	4,927	5,652	5,502	5,595	6,282	8,161	9,521	10,323	11,073	11,908	12,825
Property and casualty insurance companies	2,467	2,716	3,041	3,322	3,863	4,280	4,753	5,477	6,551	8,254	9,283
Caisse de depot	684	990	1,383	1,767	2,236	2,952	3,559	4,305	5,321	6,494	7,988
Investment dealers	795	1,236	1,752	3,040	2,953	3,447	3,661	4,689	4,657	4,524	5,512
Alberta Heritage Fund	-	-	-	-	-	-	-	-	2,218	3,374	4,705
Mutual and closed end funds	3,411	3,669	3,445	3,708	3,484	3,459	3,414	3,540	3,266	3,523	4,116
Canadian affiliates of foreign banks	-	-	-	-	-	-	1,819	1,869	2,402	3,349	4,435
Federal Business Development Bank	379	423	498	558	614	734	981	1,171	1,278	1,417	1,494
Quebec savings banks	571	542	569	637	709	805	884	971	1,118	1,270	1,452
	76,213	83,258	90,352	103,751	118,243	140,110	164,720	188,143	218,727	256,281	301,215
Rate of growth %	12	9	9	15	14	18	18	14	16	17	18
Rate of growth in GNP %	9	10	7	10	11	17	19	12	16	10	10

Source: Bank of Canada Review, Statistics Canada, Selected balance sheets

TABLE 4

Secondary trading activity in the Canadian bond and money market ($ millions)

	1975	1976	1977	1978	1st quarter 1978	1st quarter 1979
Bond trading						
Canada's due in more than 3 years	5,209	8,481	11,781	12,252	3,159	4,855
Provincials - Bonds	5,377	7,171	6,879	n/a	1,404	1,318
- Savings Bonds	46	40	2	n/a	-	-
- Total	5,423	7,171	6,991	5,636	1,404	1,318
Municipal - Bonds	607	589	934	781	279	131
Corporations- Paper due 1-5 year	366	892	1,303	2,278	578	322
- Bonds	4,518	5,461	6,169	5,044	1,464	1,399
- Total	4,884	6,353	7,472	7,322	2,042	1,721
Other	2,036	833	991	626	155	109
Total bond trading	18,159	23,427	28,059	26,617	7,039	8,134
Money market trading						
Canada bills	11,598	14,355	29,700	50,567	10,534	12,746
Canada bonds due within 3 years	5,367	3,573	3,268	3,343	1,175	822
Provincial bills	3,536	3,732	2,386	3,670	713	911
Municipal bills	1,081	1,238	963	745	297	252

TABLE 4 (continued)

Secondary trading activity in the Canadian bond and money market ($ millions)

	1975	1976	1977	1978	1st quarter 1978	1st quarter 1979
Canadian bankers acceptance	15,659	14,444	14,706	18,985	3,632	6,163
Canadian bank paper	16,055	20,028	27,254	42,351	8,508	13,425
Foreign bank snubs paper due within 1 year	1,604	2,307	8,494	13,048	2,284	4,005
Corporate paper due within 1 year	25,638	28,616	29,490	32,395	7,413	8,777
Finance company paper due within 1 year	18,892	20,630	29,114	29,421	7,073	8,573
Total Money Market Trading	$99,430	$108,923	$145,376	$194,525	$41,669	$55,674
Total bond and money market trading	$117,589	$132,350	$173,435	$221,142	$48,669	$63,808

Source: Investment Dealers Association of Canada.

TABLE 5

Secondary trading activity in the Canadian equity market (thousands)

	Toronto Stock Exchange	Montreal Stock Exchange	Vancouver Stock Exchange	Alberta Stock Exchange	Total
Volume of shares					
1979 (1st Half)	624,415	82,450	363,326	37,421	1,107,612
1978 (1st Half)	451,760	28,947	296,397	17,668	794,772
1978	984,913	62,707	596,925	40,016	1,684,561
1977	679,822	103,689	544,433	31,696	1,359,640
1976	549,210	119,337	453,919	25,784	1,148,250
1975	469,587	135,341	489,843	14,298	1,109,069
1974	568,249	227,010	557,821	6,264	1,359,344
1973	663,856	296,475	592,745	10,215	1,563,291
Value of shares					
1979 (1st Half)	9,365,527	1,317,082	478,090	98,999	10,259,698
1978 (1st Half)	4,387,273	492,190	281,037	42,827	5,203,327
1978	10,362,028	765,887	610,514	94,301	11,823,730
1977	6,044,753	1,376,613	395,075	59,081	7,875,522
1976	5,093,469	1,483,613	328,312	46,444	6,951,838
1975	4,089,020	1,384,724	314,501	17,945	5,806,190
1974	4,523,564	1,597,978	464,169	5,717	6,591,428
1973	6,737,076	2,173,992	483,271	7,123	9,401,462

Source: Toronto, Montreal, Vancouver, and Alberta stock exchanges

When you relate the size of particular institutions to the markets in which they operate, it is difficult not to conclude that the question of disproportionate size or dominance is not evident at the present time nor is it likely to become a problem in the future, given the pattern of growth and historical efficiency of the Canadian capital market. This judgment is confirmed by market experience.

THE QUESTION OF APPROVED LIST RIGIDITIES

Each lending institution generates investment policies consistent with the objectives of the particular organization. From an operational point of view, these policies show up as portfolio balance questions among various security categories, broadly speaking equity, bonds, and mortgages. Within each of these categories a list of specific approved investments is determined. It is normally and properly the case that the 'approved list' is privy to the particular institution.

If a particular institution generates excess demand, in relation to available supply, for a particular set of securities determined by that institution's approved list, do rigidities develop? Both experience and price theory tell us that potential rigidities are resolved by price adjustments.

The structure of financial asset prices is a function of relative creditworthiness, expected rates of return, supply, demand, and general market expectations about such things as inflation, economic growth, the political climate and so on. At a point in time, the foregoing factors generate a panoply of relative values. Operationally, these relative values are called yield spreads in the fixed-income markets and buy/sell opportunities in the equity market. The daily bread and butter of security traders in performing their market-making function is buying and selling relevant securities to sustain the relative value relationships. In the context of the question of rigidities, therefore, what happens when excess demand for one set of securities emerges is that the relative value of that set gets distorted. The distortion creates a multitude of trading or swap opportunities which generate the required supply to meet the excess demand. The many hundreds of over-the-counter traders in the fixed-income markets and the professional traders on the floors of the stock exchanges spend all their working hours performing this function.

In effect, the price system resolves any questions of approved list rigidities.

THE QUESTION OF FINANCIAL INTERMEDIATION RESTRAINT

This question normally is raised in the form of whether the 'bigs' support the 'smalls.' In Canada the major financing sources for small business are the chartered banks, the Federal Business Development Bank, and the Export Development Corporation. The assets of the latter two corporations are assets of Her Majesty in Right of Canada. Their liabilities, therefore, represent a claim on the Consolidated Revenue Fund of Canada. Operationally we know of no major Canadian lender that does not have chartered banks or the Government of Canada on their approved lists as revealed by their published balance sheets. In effect, the emergence of new major lenders accelerates the intermediation process.

Federal-Provincial Relations and Energy

D. G. Hartle

The Canadian energy issue involves at least four distinct arithmetics: the 'pocketbook' arithmetic of the voter/consumer, the 'seats' arithmetic of the politician (both federal and provincial), the 'bottom line' arithmetic of the investor, and last, and probably least in terms of its impact, the economist's arithmetic. The latter deals with the allocation of real resources - labour, capital, and natural resources - and with the distribution of wealth. This paper is concerned with the conflicts between these different interest groups, as viewed by an economist, as they seek to maximize their benefits or minimize their losses in response to the unanticipated and unprecedented increase in the world price of oil. In particular, I look at an aspect of the energy question that is peculiar to Canada among the industrialized nations: the economically viable energy resources are concentrated in one region of the country, and the provinces (or more properly the residents of those provinces) both own these resources and are not subject to federal tax on the income derived from them under the constitution.

Canada has been a net winner from the increases in the world price of crude oil starting in 1973. Collectively we are a net exporter of energy (currently by about $1.5 billion). Our exports consist primarily of natural gas but are partly offset by net crude oil imports. Our future reliance on imported oil is almost sure to increase, although the extent and duration of the increase is far from certain. Our natural gas exports will also certainly increase should policy permit, though again amounts and timing are undecided. On balance, however, the higher price of energy has improved our terms of trade.

But our self-satisfaction must be dampened by two facts: Canada is heavily reliant on the prosperity of the world economy, especially that of the United States. When they suffer as a result of the energy problem, so do we. Secondly, and perhaps less obviously, a massive windfall gain can cause dissension and bitterness in the most closely knit family. The bitterness, indeed hatred, engendered among family members when the estate of a wealthy relative is being divided knows no bounds. Because none of the beneficiaries-in-waiting 'earned' the assets in the usual sense, the claims and counterclaims are based on entirely subjective criteria, which are usually highly charged emotionally and seldom fail to imply an allocation favourable to those who advocate them. The controversy surrounding the Canadian energy situation has all these attributes and more.

With an intrafamily windfall the contest over shares is a zero-sum game. What one relative gets another loses. The wealth of the family remains the same; 'only' its distribution is changed. The windfall to the Canadian 'family' resulting from the surge in international oil prices is similar to a bequest in some respects but substantially different in others. Like the division of a bequest, the natural resource question is fraught with strong emotion. However, the issue is not necessarily a zero-sum game; some Canadians could be better off without others being worse off. The danger, however, is that the dispute over gains and losses will be 'solved' by dissipating the potential gains in wasteful projects or by transferring them, more or less unwittingly, to non-residents.

In this paper the problem of the short-term economic stabilization is only touched on in passing, not because I am indifferent to that important dimension of the question but because I cannot deal with it adequately here.

This paper is in three parts: an examination of the political and constitutional aspects of the question, a review of the criteria on which economic policy must be based, and a consideration of what uses the windfall gain should be put to.

The first part begins with a definition of the concept of net collective benefits arising from the ownership of non-renewable resources. It is argued that the net collective benefit should be maximized and the private benefit accruing to non-residents minimized. The division of the net collective benefit between the federal and provincial governments, or more precisely between the residents of the producing provinces and Canadian residents generally, is discussed. The federal form of government in Canada creates great complexities in devising a national energy policy. Unilateral coercive action by the federal government would conflict with the rationale for a federal system, which is based on minimization of coercion. The draconian measures available to both Ottawa and the provinces under the Canadian constitution are discussed within a bargaining context. Voter attitudes in Alberta and Ontario are sketched because these vitally affect - and largely determine - the range within which bargaining is likely to take place. Data are presented to show the marked deterioration in the economic situation in Ontario and the converse for Alberta over the past decade. The tax systems of the two governments are compared.

The second part attempts to separate those aspects of the energy issue that are universal from those that are unique to the Canadian situation. A set of policy proposals is advanced based on two criteria: allocative efficiency maximization and the maximization of the collective benefit from resource ownership under the assumption that Canada is a unitary state. The proposals advanced are intended to suggest the kinds of modifications that may be necessary to accommodate Canadian federalism. The areas discussed are future supply and demand for energy in Canada, pricing to induce conservation and substitution, frontier exploration, non-conventional oil, royalties, public transportation, and interpersonal distribution of income and wealth.

The third part considers the disposition of the proceeds of a crude oil excise tax designed to capture the windfall gain from increases in domestic crude oil prices arising from unexpected increases in the world price. Abolition of sales taxes - retail or manufacturing - is considered and a refundable personal income tax credit proposed. Proposals for natural gas pricing and exports and industry subsidies are also advanced.

THE POLITICAL ASPECTS

In what follows I employ two terms: 'collective assets' and 'collective benefits.' The former means that the residents of a jurisdiction collectively own certain property rights. The proceeds from the alienation of those rights at market prices change the composition of the portfolio of assets but not its value. The proceeds could be invested, one might suppose, in a perpetual inflation-indexed bond and the annual interest allocated on a per capita basis among the residents. An alternative, one will also suppose, would be for the government to invest the proceeds in a public facility that accorded in perpetuity each of the residents an equal or greater degree of satisfaction. Collective benefits are flows of satisfaction of the kinds just described obtained by the residents of the jurisdiction that 'owns' the mineral rights. Thus, when I allude to 'governments' capturing collective benefits I mean that these institutions are essentially 'black boxes' that produce from such collective ownership a flow of satisfaction to individual residents in the jurisdiction.

A non-renewable resource situated within the territory over which the government of Canada holds sovereignty is an asset in three senses:

- It is a collective asset of the citizens of Canada because of the recognition accorded by other nation states to the government of Canada. This means that the laws of other nations do not have force or effect (at least directly!) within Canada. This recognition is accorded because the federal government exercises de facto power. (Ultimately this means federal police or military control.)
- Unless already alienated, it is a collective asset of the residents of the province in which it is situated by virtue of the powers conferred on the province under the constitution.
- It is an exclusive right held by a person (corporate or other) either because ownership of the property right has been alienated or because the provincial crown[1] has sold certain conditional rights to exploit the resource.

In the long term the lion's share of the collective gross benefit derived from a non-renewable resource (asset) situated within Canadian territory can be derived from the following:

- sale of the right to exploit the resource at a price that equals the present value of the expected market value of the future output net of the costs of obtaining the output;
- taxation of the output as such or of the profit derived from its extraction and sale (taxed in the hands of a corporate or a resident individual or by a withholding tax imposed on income flowing to non-residents); and
- extraction and sale of the output by a government agency at a price that more than covers direct costs.

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[1] Or the federal crown in the case of the Yukon and Northwest Territories. The east and west coast offshore mineral rights are of uncertain federal or provincial ownership, although a temporary agreement has been reached on the division of any proceeds.

Offsetting such gross collective benefits are the largely input costs of the infrastructure requisite to production: transportation/communication/ power systems, and the extra social capital required, if any, that is not financed by the producers.

When the resource is exploited by the private sector and the net collective benefits are not maximized, the result is either a transfer of wealth from some Canadian residents to other residents or, if the ownership of the enterprise is not held by residents, a transfer of wealth from Canadian residents to non-residents. Conceivably, in the latter circumstances, if the foreign-held resource-exploiting corporation did not bear the infrastructure and social capital costs described, Canadians collectively could be made worse off by not leaving the resource in the ground. Given the overwhelming preponderance of foreign-owned and controlled oil corporations in the Canadian petroleum and gas industry, the problem of realizing the maximum net benefit for Canadians is by no means imaginary. It is assumed that capturing the maximum net benefit for Canadians is a goal universally accepted by Canadians.

It also might be accepted by all Canadians that, apart from the problem of distributing collective benefits, individual Canadians should in principle be prevented from seizing for themselves any part of the collective benefit. However, there certainly are widely diverging views about the application of this principle. Some argue that in a dynamic and uncertain world, unless substantial net windfall gains can accrue to individuals, entrepreneurship and risk-taking will be stifled, ultimately reducing the future net collective benefit.[2] Although there seems to be an element of validity to the argument, its proponents, if given their heads, would obviously apply the 'principle' not only to capture for themselves the net collective benefit but also to inflict net collective losses on other Canadians by not bearing the requisite extra costs. The question of special concessions required to compensate for the problems of uncertainty has led to endless rancour and controversy over how to tax extractive industries in all democratic nations. Indeed, the battle between individual and collective interests, far from being confined to words, entails stakes so large that intimidation, bribery, and probably worse have sometimes been involved.

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[2] The windfall gains resulting from the increase in world crude oil prices hardly seems comparable to those arising in the markets for most goods.

Provided that a public enterprise could be managed as knowledgeably and efficiently as a private enterprise in the petroleum industry and that the decision of the management of the public enterprise reflected the same preferences towards risk, the question of the 'appropriate' tax regime could be sidestepped. The ownership, extraction, and sale of petroleum or gas could be assigned to a government agency. The gross profit of such an agency would, by definition, include the collective benefit. Conceptually, however, this gross profit should be divided into three parts: the value of the resource itself, the opportunity cost of the capital and labour employed in finding and extracting the resource, and the taxes forgone because the private sector is not involved.

To put the matter in a slightly different way, assuming the effective corporate tax rate were the same in all industries, from the gross profit should be subtracted an amount equal to the before-tax rate of return prevailing in other industries multiplied by the capital invested by the public enterprise. The present value of the balance would be the value of the resource. This would be the net collective benefit of the possession of the resource, assuming all the additional infrastructure and other costs were taken into account in calculating gross profits. The gross profit of the public enterprise would accrue, of course, to the public treasury and would permit tax reductions or improved government services or increased transfer payments that would constitute a kind of 'dividend.' Part of the gross profit might well be reinvested in the enterprise itself through the retentions of earnings.[3]

Unlike many others, I am not persuaded that the foregoing assumptions about public enterprise management are altogether unrealistic, except with respect to risk-taking. And even here the difference need not be great if ministers do not have to account for every dollar spent. With a degree of autonomy, some managerial 'mistakes' then can be permitted a public agency . I am convinced, however, that the managements of both large, widely held private enterprises and 'independent' government agencies (e.g. CDC, PetroCan, and AECL) are difficult to control. The interests of managers and shareholders are not always (or perhaps even usually) identical. The personal interests of the managers dominate, not surprisingly. If anything, the management of crown corporations is frequently under less scrutiny than private sector management.

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[3] We ignore the sticky question of the imputed rate of interest appropriate in assessing the 'profits' of public agency projects.

As though these problems were not sufficiently complex, Canada faces a unique conundrum. Even if the Canadian net collective benefit were maximized, how should it be divided between the residents of the provinces where the resources are located (via the relevant provincial governments) and the residents of other provinces (via the federal government)? The severity of the problem is intensified by four facts: most marketable petroleum resources are found in Alberta, and to a much lesser extent in Saskatchewan and British Columbia; the rights to those resources are held by the respective provincial governments; the power to regulate and control the resources within the province, including controlling exports from the province, also rests with these provincial governments; it is doubtful that the federal crown can tax a provincial crown, to use the language of the law. Clearly, if the whole of the net collective benefit were captured by a few provincial governments on behalf of the residents, the oil and gas deposits would disappear as national assets. For Canadians living outside the producing provinces the resources might just as well be shifted south of the Canadian border or the border shifted north to encompass the resources.

Strangely enough, if the net collective benefit were to be completely captured by the residents of the producing provinces only, the residents of other provinces probably would be better off if the collective benefit were small and most of it were captured by Canadian individuals in one form or another. Although the federal corporate and personal income tax systems are most imperfect instruments for the purpose, some of the collective benefit captured by individual Canadians eventually would accrue to Canadians not residents in the producing provinces through, if nothing else, the deemed realization of capital gains at death.

There is a real danger that, in the fight between the producing and consuming provinces (through the federal government) over the distribution of the collective benefit, the private benefit will gain at the expense of the collective benefit. Or, what is worse, the total benefit will be reduced by squandering the asset either through inordinate consumption brought about by prices that are too low or through hoarding the resource as though time were not also a non-renewable resource for each individual. This is the issue addressed in this paper.

The rationale for a federal form of government

If all of the residents of a sovereign state had identical tastes and preferences there would be no reason for a federal form of government, although there might well be a justification for some delegation of authority to local authorities to achieve greater efficiency in coping with circumstances that differed from area to area. Even if the residents were diverse in tastes and preferences but there were no geographic clustering[4] of those who differed less among themselves than they differed from those living in other areas, there would be no rationale for a federal system. However, when geographic clustering is present it is possible that a constitutional division of powers can be devised that will make some residents of a nation better off without injuring others. This is possible because non-unanimous collective decisions are, by definition, coercive for the minority. By allowing differences in collective decisions between regions where there are significant geographical differences in tastes, minorities are made smaller, and the degree of coercion can, under some conditions, be reduced while the economic benefits of the larger unit are retained. The necessary conditions are set forth below.

The responsibilities and the powers assigned to provincial governments must:

- not empower provincial governments to erect barriers to the interprovincial movement of persons, goods, and capital;
- not assign powers or responsibilities to provincial governments that would permit the residents of one province to impose costs on the residents of other provinces that they do not bear themselves; and
- not assign responsibilities to provincial governments that, if fully borne by the residents of one province, would accord benefits to residents of another province, for this would result in the underfulfilment of the responsibility.

The exclusive powers assigned to the central government must include control of national borders with respect to flows of people and goods and the money supply. The central government also must be exclusively responsible for international relations and for the provision of services that provide benefits to the residents of more than one province (e.g. defence, interprovincial transportation, communications and research) and must have the taxing powers necessary to finance the provision of these services. More disputable, the central government must have the power to pre-empt temporarily the constitutional powers of the provinces when necessary to meet exigencies in a state of 'emergency' (somehow defined).

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[4] The clustering can come about by individuals voting with their feet and moving to the area with the most attractive public sector from their point of view. It can also occur because of the inculcation of common values through prolonged proximity.

Excluding the use of force, and ignoring that most important intangible 'national pride,' for the federation to survive the majority of the residents in each state must perceive that, on balance, they would be better off as part of a federation than if they were governed autonomously. This means, in effect, that they must believe (consciously or unconsciously) that the gains from the avoidance of economic barriers, the economies realized by the common provision of some services, and the increased international bargaining power of the larger unit more than offset the greater coercion (relative to complete provincial autonomy) that can and often does arise through the exercise of central powers and through the central government's response to its exclusive responsibilities. Coercion by the central government can arise not only because of the geographic specific differences in tastes and preferences we have already mentioned. The assets held by individuals resident in different provinces differ in a non-random manner with respect to composition and average value. The interpersonal distribution of holdings also differs from province to province.

In consequence, each central government policy, although in principle it applies equally across the whole nation, does not have the same effects in all regions even on a per capita basis. Because there are significant differences among the residents of regions with respect to tastes, wealth and physical circumstances (e.g. climate and topography) virtually all central policies benefit or harm the average resident of one or more provinces more than the average resident of others. This unevenness of application is not unique to central government policies, of course. An act of a provincial legislature is most unlikely to have a homogeneous effect in every area of the province.

The competition among political parties for votes usually restricts the extent to which the residents of a province or of groups of provinces are persistently coerced for the benefit of the residents of other provinces. In the endless sequence of policy decisions a kind of logrolling takes place. For most groups most of the time, the losses under one policy are offset by gains under a subsequent policy.

Just as Adam Smith's invisible hand, the pursuit of self-interest within a market system, can produce a beneficial unintended private result, so the pursuit of self-interest by politicians working within a federal political system can result in sequential logrolling that minimizes the degree of coercion (directly and indirectly, openly or covertly). Ideally the residents of each region will be left with an eventual net benefit from their membership in the federation compared to complete autonomy.

It is crucial to realize that many of the items in the voter's benefit/cost calculus are intangible, and that individual perceptions of net benefits are the only reality. If the residents of a region believe they have been persistently coerced by the residents of other regions, and that this process will continue in future whatever legitimate actions they take within the existing political system, a demand will emerge for violence or subversion, for greater regional (provincial) autonomy, or for secession from the federation.

Although a federal form of government can in principle make some residents of the federation better off without making others worse off, it may not. The majority can still use the federal powers to coerce the minority (not provide the losers with adequate compensation) by electing governments that persistently adopt policies that coerce the residents of a particular region or province. The degree of central government coercion of the residents of a province is likely to be less, or the degree of compensation greater, the more decisive the votes of the residents of a region are in the election of national parties. It is also true that particular provinces can coerce the majority. This can occur if the province with a minority of the national population has some kind of monopoly power that allows it to exact, on behalf of its residents, all the benefits from the federation for itself. Albertans may believe that they were once victimized in this way by rapacious easterners, whereas Ontario residents and other easterners may see Albertans as now doing the same thing.

The conventional rationale for a federal system does not provide any specific guidance on the natural resource question. It does suggest, however, that a federation can provide a kind of efficiency gain in enabling some to become better off without making anyone worse off if the losers are compensated. The danger is that if the minority attempts to use its quasi-monopoly powers to exact all the benefits from the federation, the majority will coerce the minority so blatantly that the federation will collapse.

I referred earlier to the clustering of individuals with like tastes and preferences as a necessary condition for a federal state to confer a benefit relative to a unitary state. This clustering can come about either because 'birds of a feather flock together' or because birds that live together for a protracted period eventually have the same feathers. Clustering is a crucially important dimension of the new-found wealth of the western provinces generally and particularly of Alberta. The economy of that province is more buoyant than those of the others, some of which are quite depressed as far as job opportunities are concerned. Taxes are much lower in Alberta than elsewhere in Canada, even though the quantity and quality of public services are almost certainly higher there.

If the windfall gain generated by the increase in world oil prices were shared by all Canadians the inducement to migrate to Alberta would be relatively modest. Conversely, if all the net collective benefits were retained by Alberta, they would eventually be shared by the migration of other Canadians to that province. Because ready access to markets largely determines industrial location, the migration would be exponential, with large urban-industrial centres rapidly developing in the province. As a consequence, those owning residential-industrial property in prime locations will capitalize and 'privatize' the collective wealth of the province through higher and higher land prices. Immigrants to the province drawn to the rapidly expanding centres will also compel exponential increases in the social capital and other government expenditures that will, eventually again, draw down marketable assets and ultimately raise tax rates. In short, unless the province is able to close its borders to people, a slow but inexorable equilibrating process would occur if the collective benefit were sequestered entirely by the province.

The Canadian constitution

The Canadian constitution is embodied in the British North America Act (as amended), a statute of the Parliament at Westminster, in earlier decisions of the Judicial Committee of the Privy Council (again at Westminster), in certain decisions of the Supreme Court of Canada, and in Canadian parliamentary and other practices, including federal/provincial consultative practices. The constitution has proven to be remarkably durable, probably because it is remarkably flexible, Canadian folklore notwithstanding. Painfully, slowly, and often with irritating rhetoric, bombast, and gamesmanship, the conflicts among the provinces and between one or more of the provinces and the federal government, and thereby directly or indirectly between the innumerable interest groups that comprise the federal and provincial electorates, have been resolved or buried without significant violence. Ever-shifting alliances, coalitions, and logrolling have been inevitable.

The Canadian constitution is not in any sense ideal, but it is the only one we have. It does determine to a considerable extent the basic structure and processes by which major conflicts are resolved in this country and hence can be assumed to affect, for better or worse, our most vital collective decisions. The constitution particularly affects the energy issue. Indeed, it would not be surprising if the constitution (broadly defined) were altered as a result of energy disputes. The political problem this issue creates is so acute, and hits so close to the heart of the alliance, that it could conceivably lead to a breakup of the federation as we now know it.

The 'constitutional problem' is a legal one in only the most superficial way. If there were a way of achieving consensus, anything could be done by federal/provincial agreement. The constitution would not be a barrier. Conversely, in the absence of a consensus on a problem there can be no agreement about a constitutional change that would remove a barrier to a particular course of action. Of course circumstances alter cases in constitutional matters as in all others.

The provisions of the Canadian constitution relevant to our purpose are as follows:

(1) Sections 109 and 117 of the BNA Act gave the original four provinces ownership rights, which included mineral rights, over unalienated crown lands within their boundaries. When the Western prairie provinces evolved from the North West Territories (Alberta in 1905), 'the first economic colony of the central Canadian heartland' in Donald Smiley's phrase,[5] the ownership of natural resources was retained

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[5] Donald V. Smiley, 'The political context of resource development

by the federal government. It was not until 1930 that by mutual agreement the Bennett government (Bennett having come from Calgary!) petitioned Westminster for an amendment of the BNA Act transferring land ownership to the Western prairie provinces.

At the turn of the century when Saskatchewan and Alberta came into being agricultural land was the chief natural resource of economic significance in the region. Presumably the federal government had no intention of giving this asset to the new provinces for the exclusive benefit of the relatively few residents at the time. By 1930 agricultural settlement in the region was virtually complete, and the transfer of land ownership to the provinces by Ottawa was no doubt thought to be primarily a symbolic gesture. Provincial land ownership and ownership of the minerals located in these lands confer on the province the powers of 'management and sale' under Section 92(5) of the BNA Act. This means that the provinces can refuse to sell the minerals they own for export out of the province. Furthermore, Section 92(13) accords the provinces exclusive powers over the enactment of laws relating to 'property and civil rights' in the province. Provincial ownership, along with these extremely important additional (legislative) powers, undoubtedly gives the provinces the constitutional power to control and regulate every aspect of the petroleum resources found in them.

(2) Provinces can only impose direct taxes (Section 92(2)). Thus they cannot impose taxes that would discriminate against non-residents of the province nor can they adopt laws that would constitute the regulation of interprovincial or international trade. These limitations were reaffirmed by the recent Supreme Court of Canada decision against the government of Saskatchewan in the Canadian Industrial Gas and Oil Ltd case and the Central Canada Potash case.

(3) The government of Canada can regulate and control all aspects of these resources if and when they are exported from a province (Section 91(2)). The federal government, in addition, has, with one possible exception, unlimited taxing powers (Section 91(3)). The possible exception concerns federal taxation of an agency of a provincial government. Although this issue has not been decisively settled by the courts, it has been argued that the crown in right of Canada cannot tax

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in Canada.' In Anthony Scott, ed., Natural Resources Revenues: A Test of Federalism (Published for the British Columbia Institute for Policy Analysis by the University of British Columbia Press, 1976) 65.

the crown in right of a province (Section 125).

(4) Section 92(10) gives the federal government jurisdiction over 'works or undertakings connecting the provinces with any others of the provinces, or extending beyond the limits of the province.' Interprovincial pipelines clearly fall under federal jurisdiction.

The federal government has the constitutional power to declare, retrospectively or prospectively, a 'work of undertaking,' although wholly situated in a particular province, 'to be for the general advantage of Canada or for two or more of the provinces.' (Section 92(10)(c)). This power has been exercised to extend federal control over all aspects of uranium production. From a strictly constitutional point of view, and ignoring all political realities, the federal government could thus gain control of, say, all oil and gas installations (as distinct from the resources themselves) within Alberta.

The clause preceding the items enumerated in Section 91 of the BNA Act gives the federal government power 'to make laws for the Peace, Order and Good Government of Canada.' This has been interpreted by the courts to mean that by declaring a national emergency to exist the government of Canada can in effect pre-empt the constitutional powers of the provinces for the duration of the emergency.

The powers cited in the previous two paragraphs might be labelled the draconian powers of the federal government. (The power of federal disallowance of provincial statutes is so draconian as perhaps to have become anachronistic.) The provincial power to refuse to export petroleum and gas from the province, a power that seems abundantly clear with respect to the output from lands that they own, and the power to levy direct taxes (e.g. royalties) without limit, can likewise be labelled the draconian powers of the petroleum-rich provinces.

The essence of this complex constitutional situation is that the effective (i.e. non-draconian) constitutional powers of the federal government and the government of Alberta are so nicely balanced that, except for extreme moves on either side, each can offset, or more than offset, the policy initiatives of the other. This fact was brought home by the tug-of-war over petroleum resource revenues that followed the increase in the world price of crude oil in 1973. Alberta increased its royalties to capture some of the windfall gains (rents) for the province. But because royalties were deductible for federal (and provincial) corporate tax purposes, this increase had the effect of pre-empting federal corporate tax revenues. The federal government retaliated by disallowing the deduction of royalties altogether. This action reduced the profitability of investments in petroleum exploration and development and resulted in a sharp decline in those activities. (Probably this dramatic result was strategically staged by the large producers.) After a painful confrontation the federal government indirectly backed off to a degree by introducing a resource allowance that in effect reduced the federal rate of corporate tax on resource profits. Both sides have expressed grave concern that this kind of competition for resource rents can do great damage by increasing the level of uncertainty faced by investors.[6] The federal government has been adamant, however, that it must secure some of the rents generated by unanticipated increases in crude oil prices for the benefit of Canada as a whole.

Federal use of the draconian measures described above depends primarily on public opinion. Although party loyalty is for various reasons extraordinarily strong under the Canadian parliamentary system, even a majority government could not be certain to gain majority support for extreme measures unless public support was overwhelming. Even then, because the degree of coercion would be so great, with a significant minority of Canadians (certainly those resident in Alberta!) violently opposed, a majority government attempting to exert its full constitutional powers would likely be split. Even members not adversely affected themselves by the draconian action might well object to the means employed. Should party loyalty survive such a test, a federal party that resorted to extreme measures without the strongest support from the vast majority of voters would almost certainly not survive the next general election.

On the provincial side, probably the most extreme measures available include the 'nationalization' of the petroleum industry in the province, which would put to the test the ambiguous federal taxing powers with respect to the provincial crown, the imposition of stringent restrictions on exports from the province, and increasing provincial royalties or similar payments that could effectively reduce exploration and development. The first measure would presumably find little public support among the residents of Alberta, who seem committed to private rather than public enterprise. However, with enough provocation from outside the province Alberta opinion might change dramatically. The second measure, an embargo on exports from Alberta, could conceivably be invoked only briefly and in a situation of extraordinary confrontation. If invoked prior to federal provocation (as seen through Albertan eyes) one might expect in response a federal escalation that involved recourse to one of its draconian powers. If invoked by Alberta in response to a hostile federal act, it is difficult to see how some military or police action would not ensue.

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[6] 'Federal-Provincial Resource Taxation Review.' Joint report by federal and provincial officials to First Ministers and Resource Ministers, First Ministers' Conference on the Economy, 27-8 November 1978. Document 800-9/018

Some combination of a reduction in exports from the province plus a slowing down of exploration and development (the third and last of the provincial draconian moves we have identified) would seem more likely. Alberta could argue that it would reduce exports to protect its depleting resources and that it needed higher royalty revenues to save for the future. Furthermore, it could argue that too rapid a pace of exploration and development was putting undue strains on the economy and social fabric of the province. The government of Alberta is already overwhelmed in the flood of cash. With prices of oil and gas almost certain to rise both in real and nominal terms, a strong argument could be made that the net worth of the province would be maximized by leaving more of the oil and gas in the ground.

Other constitutional instruments are available to both parties and certainly many other strategies more subtle and probably much more effective than those I have sketched. I have raised the issue not to imply that the energy crisis entails federal-provincial relations as bellicose as the scenarios outlined above. However, it must be remembered that 'the Constitution' is not a fixed and certain set of rules. Rather it is constantly changing, and its meaning and effectiveness at any moment depend critically on public perceptions of the issue at that time. Most of the time for most 'small' issues the constitution can be taken as given. Actions by either the federal government or a provincial government of questionable legitimacy are rare, and court decisions apparently settle the matter while at times remoulding 'the Constitution.' Similarly, whenever a high degree of public consensus exists on a policy issue, federal/provincial bargaining rarely raises a constitutional issue. But when a strong division of opinion exists about what is widely perceived to be a matter of great importance the draconian powers of the parties become relevant because they tend to legitimize certain kinds of highly coercive actions in an extremely complex and emotionally charged intergovernmental bargaining process. This process can lead to changes in constitutional rules.

To put the matter in a slightly different way, the constitution is to federal/provincial bargaining what labour legislation is to labour management relations. The constitution provides the provinces (labour) with certain rights that increase their bargaining power vis-à-vis the federal government (management) at least in the sense of bringing the latter either to the courts or to the bargaining table if legitimacy is to be maintained.

However, the analogy quickly collapses if pushed too far. Voters are simultaneously residents both of a province and of Canada; they are in a sense both on the labour side and on the management side. The result can be a peculiar kind of voting paradox. A majority federal government can claim that it speaks for a majority of Canadians on a specific issue, and a majority provincial government taking a contrary view can claim that it speaks for the majority of the residents of that province. Actually, unless the specific issue completely dominated both the preceding federal and provincial elections, so that both could be construed as referenda, a confrontation can result between the federal government as a party organization and one or more provincial governments, also as party organizations where neither side has much, if any, real support for its stand. However, as far as petroleum resources are concerned the interests of the Alberta voter are so overwhelmingly obvious, as is the legislative majority of the present government of Alberta, that there seems little doubt that unless it behaves in some extraordinary manner it can and will speak, and be thought to speak, for the vast majority of Albertans in any energy policy debate. On the other hand the minority federal government, in part of course because it is also the national government for Albertans, and the minority government of Ontario are unlikely to be able to muster such a common front. However, relative numbers are important. In petroleum resource terms Alberta is an extremely rich province. But as yet Alberta is population poor, at least from a proportional representation point of view. The vast majority of other Canadians are virtually certain to perceive that they would gain by putting pressure on their respective provincial governments and their federal government to resist oil and gas price adjustments that would increase the income and wealth of the government of Alberta and Albertans at their expense, not to mention the oil companies! This pressure will be restrained in the Atlantic provinces by the hope of offshore oil and gas and the possibility of more generous equalization payments.

As will be discussed later, although the majority of Canadians might through such a strategem preclude an immediate loss for themselves and thereby a gain for Albertans and the petroleum corporations, the result in the long run is bound to be a greater aggregate economic loss, in particular because demand will not be constrained by higher prices that reflect the greater scarcity of oil. The ultimate political cost of such a strategy might well be even greater in view of the rage that would be engendered among Albertans.

Voter attitudes

More than most policy decisions, the energy question threatens the existence of the Canadian federation. Unlike Quebec's longstanding dissatisfaction with the status quo, which most Anglophones claim not to understand (an attitude that is the very reason for the dissatisfaction!), what is happening in Alberta increasingly is being understood all too well. The pocketbook, the thermostat and the gas gauge speak a language that Anglophones do not lightly dismiss.

The formation of a federation is a political act: the negotiation of a kind of overarching contract that purports to resolve the conflicting interests of quasi-autonomous groups with the promise that the gains to be had more than offset the losses. Over the years the residents of all the provinces except Ontario have, more or less continuously, with greater or lesser degrees of intensity, asked themselves whether or not the federation provided them with a net benefit. Often enough they came to the conclusion either that it was a net burden or, perhaps more frequently, that if they were not worse off Ontario had still pre-empted a disproportionate share of the benefits.

More than half of Canada's population does not reside in Ontario. Almost by definition this means that a majority of Canadians would like to see 'Ontario get its comeuppance.'

Perhaps for the first time since Confederation, the economic dominance of Ontario is threatened by Alberta's energy bonanza. The result is a political problem of the first magnitude. At the federal level, no party can form a government without strong support in Ontario. At the provincial level, no party forming a government in Ontario can seem to stand idly by while Ontario becomes a 'have not' province. Albertans are adamant that they keep virtually everything for themselves. The other provinces, no doubt enjoying Ontario's discomforture, are watching the battle, some of their premiers seeking to shift the blame for higher energy costs elsewhere while looking for 'solutions' that would provide them with politically costless funds.

The 'solution' to the conflicting interests involved must ultimately be a political one, invariably and primarily involving voter perceptions. The voters' perceptions are the politician's reality. Voters in different provinces have widely diverging views of the energy situation. Casual observation (in part based on a prairie upbringing) suggests to me that the people of Ontario and Alberta have completely different perceptions of each other, and of 'the facts.'

For many, many decades a high proportion of Albertans have been utterly convinced that 'the East,' and most especially 'Ontario,' became wealthy at their expense. Many, and perhaps most, Albertans firmly believe that 'Bay Street' has conspired to control the Ontario government and, to a substantial extent, the federal government in order to raise the prices of the goods and services Ontario sold to the West and to lower the prices of the things bought from the West. They are also absolutely convinced that this 'conspiracy' included the denial of economic development to Alberta in order to provide a captive market for Ontario goods and cheap raw materials for Ontario businesses. In short, Albertans, and other westerners too, believe that they have been treated as a colony of the central, industrialized part of Canada.

Albertans have their own version of the 'facts,' a version of Canadian history evolved in newspapers, speeches, and endless discussions. This subject has dominated most of their conversations related to political or economic matters. Nothing unites a group like a perceived common enemy. Convinced that they have long been consciously exploited by 'easterners,' the majority feel quite justified in 'getting their own back' now that the Golden West has become a reality rather than a dream.

Because petroleum resources are non-renewable, and because Alberta's conventional crude oil reserves are declining (if secondary and tertiary recovery is ignored), Albertans have persuaded themselves with little effort that the astronomic increase in provincial revenues from petroleum is only temporary. In their view, due concern for future generations of Albertans dictates, therefore, that the provincial government save a substantial part of these windfall revenues as a legacy, an easy justification of self-seeking behaviour. The reality is that while Alberta's conventional oil reserves are declining the province's resources of recoverable gas are increasing dramatically in response to higher prices. To be specific, the Alberta Energy Resources Conservation Board (hardly a radical group) in its most recent Annual Report (August 1979) acknowleged a 4.4 billion cubic foot addition to the province's gas resources in the year past, more than twice the amount produced that year. With higher conventional crude oil prices the province's heavy oil, bituminous sands, and vast coal deposits are now of increasing economic value (particularly when their development is largely financed at the expense of Canadian taxpayers, generally). If Albertans are selling off the highway frontage of the family farm, so to speak, the value of the uncultivated back acres is rising even more rapidly. Even without saving for the future in the ways described, the wealth of the Albertan family is soaring. The 'legacy' argument provides a semi-respectable justification for an attitude on the part of some Albertans better described as: 'its ours, we deserve it, and we'll damned well keep all of it for ourselves.' Generations of resentment coupled with blatant self-interest make for strong attitudes!

The vast majority of Ontario voters have been completely, and no doubt smugly, indifferent to Westerners' views of them. To the limited extent they were aware of them they find them amusing. It is not that Ontarians have a strongly held contrary interpretation of Canadian history. Generally speaking, they have no comprehensive knowledge of, much less interpretation of, the history of Canada and the place of Ontario in it. Westerners seem unaware that the massive immigration to Toronto in the past three decades has radically changed the cultural climate. Ontario residents do not think of the West as 'their colony' any more than they think of themselves as a British colony - a quaint notion nowadays in Ontario. They certainly do not suffer from a sense of guilt towards the West - or the East for that matter - because they cannot see how they have hurt the residents of other provinces. If anything they feel warm in contemplating their past benevolence. To their minds the past pre-eminence of Ontario was a gift from God, augmented by their diligence, and remote from the spoils of piracy. Ontarians do not think of themselves as part of a conspiracy to exploit Westerners or anyone else.

Ontario voters would accept an important role for themselves in federal politics as only proper in terms of Ontario's size, location, and economic importance. Probably many Ontario voters think their province had had too little influence in Ottawa compared to Quebec. That the other eight provinces have any influence at all is the source of some astonishment.

As for the 'Bay Street' conspiracy, whatever that is, probably a higher proportion of the residents of Ontario are resentful of 'big business' than are residents of Alberta. Albertans seem to overlook the fact that what 'Bay Street' does to them as consumers it also does to consumers in Ontario. Moreover, many Ontario voters working on the production lines operated by 'big business' think of themselves as being 'ripped off' by management and certainly not part of a conspiracy to cheat Westerners. Neither group thinks of the other as consisting of individuals as similar and diverse as themselves.

It is obviously completely out of the question to attempt here an analysis of why until recently per capita incomes have been persistently higher in Ontario than in Alberta. Nor is it feasible to assess who gained and who lost on a province-by-province basis on each federal policy over the last seventy years. Because the political process inevitably involves compromises, it is questionable that a policy-by-policy analysis can provide more than some perspective. What is needed is a comprehensive history of the economic development of the West.

Be that as it may, even the obvious economic trends of the immediate past are probably not fully perceived by Canadian residents either in Alberta or Ontario. I believe that neither group fully appreciates just how far the relative economic position of Ontario has declined in recent years. Table 1 summarizes the situation for the period 1968-77 (the latest date for which consistent data are available for all series). Over the period the Alberta economy has rapidly gained ground relative to the Ontario economy - and at an accelerating rate.

The changes in the revenues and expenditures of the two provincial governments show an even more dramatic disparity in Table 2. From 1973

TABLE 1

Population, personal income, provincial income, unemployment rate, inflation rate, 1968-77

	Ontario				Alberta			
			Compound growth rates				Compound growth rates	
	1968	1977	68/78	73/77	1968	1977	68/78	73/77
			%	%			%	%
Population (million)	7.306	8.3735	1.53	1.34	1.526	1.8997	2.46	3.97
Provincial income								
Total ($billion)	23.496	66.131	12.18	13.38	4.528	18.923	17.22	21.18
Per capital ($thousand)	3.216	7.898	10.50	11.88	2.967	9.961	14.40	17.57
Gross Domestic								
Total ($million)	30.771	84.651	11.90	13.05	5.829	23.479	16.74	20.79
Per capita ($thousand)	4.212	10.109	10.22	11.56	3.819	12.359	13.94	17.19
Personal Income								
Total ($billion)	22.844	67.739	12.84	14.16	4.111	14.672	15.18	18.38
Per capita ($thousand)	3.127	8.089	11.14	12.65	2.694	7.723	12.41	14.85
Percentage of Canada								
Federal basic tax (PIT)	45.17	40.26	-1.27	-2.10	6.99	9.62	3.61	6.92
Corp. taxable income (adj)	45.23	36.38	-2.39	-5.01	7.91	22.61	12.38	21.81
Unemployment rate	3.6%	7.0%	7.67	12.96	3.3%	4.5%	3.51	-4.01
Price level (Toronto & Calgary) (1971 = 100)	90.59	157.3	6.32	10.08	91.03	158.0	6.32	9.32

SOURCE: Tables A.1 and A.2

TABLE 2

Provincial government revenue expenditure and surplus or deficit on a National Account basis 1968-77

	Ontario				Alberta			
			Compound growth rates				Compound growth rates	
	1968	1977	68/78	73/77	1968	1977	68/78	73/77
Total revenue	3557	11671	14.11	14.10	711	5059	24.35	31.63
Total expenditure	3322	12501	15.86	16.31	791	3440	17.74	21.78
Savings (deficit)	235	-830	-	-	(-80)	619	-	-
Capital consumption allowance	89	329	15.64	20.51	35	130	15.70	21.84
Gross capital formation	248	601	10.34	7.80	81	306	15.91	20.53
Surplus (deficit)	76	[-1102]	-	-	[-126]	1443	-	153.40

SOURCE: Tables A.3 and A.4

to 1977 Ontario revenues grew at an annual rate of about 14 per cent: those of Alberta grew at a whopping 31.6 per cent! Despite the fact that the current expenditures of the Alberta government have been growing much more rapidly, in 1977 (the latest date for which data are available on a National Accounts basis) Alberta saved $1.6 billion while Ontario borrowed about $0.8 billion.

The reason for the differences in revenue growth are obvious. Total natural resource revenues (in millions of dollars) changed as follows in the two provinces:

Natural Resource Governmental Revenues

	(in $ millions)			Compound Growth Rates	
	1968	1973	1978	1968-78	1973-78
Ontario	54.9	63.0	117.0	7.86%	13.2%
Alberta	230.4	351.9	3658.7	31.85%	59.7%

From 1973 through 1978 the Ontario 'take' was $0.7 billion the Alberta 'take' was $10 billion.

The sources and (uses) of funds of the two provinces from 1968 through 1977 are shown in Table A.4 and A.5. From 1968 through 1977 Ontario was a net borrower every year, up to nearly $1 billion in 1977. Since 1973 Alberta has been a net lender, up to nearly $1 billion in 1977. From 1973 through 1977 Ontario increased its indebtedness by $3.7 billion; Alberta acquired assets (or reduced its liabilities) by $2.7 billion.

If we include the Alberta government's grants to its municipalities of about $1 billion (to allow them to eliminate their debt) and the province's contribution to the Heritage Fund of about $1.5 billion, the government of Alberta anticipates a surplus of about $2.5 billion in fiscal 1979-80 - the provincial treasurer of Alberta is not noted for undue optimism in these matters.

The most recent Ontario budget estimates a continuation of the deficit at roughly the same level as in the recent past despite heroic, and politically painful, efforts to impose expenditure stringency.

The position of the Alberta resident is actually materially better than the rather extraordinary differences previously described would suggest. Ontario is by no means a high tax province compared with, say, Quebec. However, the Ontario taxpayer is being ground into the ground compared with the Alberta taxpayer. The effective tax rates of Ontario and Alberta for 1976-7 were as follows:

	Ontario	Alberta
Personal income tax	0.3179*	0.2772*
Corporate income tax	0.1325	0.1843
Sales tax	0.709	0.0020
Motive fuel tax/gal	0.000199	0.000115
Alcoholic beverages	0.0170	0.0195
Other (excluding resources and real property)	0.0071	0.026

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* The difference between the two effective corporate rates can be explained by Ontario's concessionary rates for small business. Alberta has since more than followed suit.

These differences in effective rates superficially do not appear large, but when applied to their respective bases this impression is dispelled. Consider the following results for 1976-7 (billions of dollars):

	Ontario	Alberta
Actual revenue	6.52	1.16
Hypothetic revenue had the effective rates of the other province been in effect	4.24	1.81
Absolute difference	-2.27	+0.65
% Difference	-34.9	+55.8

Source: These tables are derived from Tables A.7 to A.9

Had Alberta tax rates prevailed in Ontario, Ontario's tax collections would have fallen by nearly 36 per cent. Had Ontario rates been imposed in Alberta, tax collections would have risen by about 56 per cent. These estimates take into account neither natural resource revenues nor differences in real property taxes. The Alberta treasurer acknowledged in his

1979 budget that 'homeowners in Alberta continue to pay property taxes that were among the lowest in Canada.' Despite this fact he then announced that the provincial government would make grants to the municipalities to enable them to discharge their debts. The grants will total, as previously stated, about $1 billion.

If we make the rough-and-ready assumption that Alberta government revenues (aside from natural resources) would be about 56 per cent higher with the effective tax rates of Ontario, the estimated total tax revenues in that Province (aside from resource revenues) for 1979-80 would not be $1.2 billion in 1979, as the Budget states, but $1.9 billion. To the 'surplus' of about $2.5 billion, discussed above, about $0.7 billion should be added.

There is no mystery about the chief source of the Alberta taxpayer's 'savings': Alberta does not levy a retail sales tax; Ontario collects well over $2 billion a year from this tax.

These kinds of numbers do not prove anything about the rights or wrongs of the situation. But they may well be sufficient to arouse the voters of Ontario. Ontario voters pay taxes that are at least 35 per cent higher than those faced by Alberta voters, with public services that are no better and probably worse. Yet the government of Alberta is running increasing and extremely large surpluses while Ontario is running persistent deficits. Alberta residents are accumulating a legacy of wealth for themselves, a legacy that is estimated to reach about $25 billion by 1985. Ontario residents meanwhile are accumulating a legacy of an ever growing debt that future residents will have to service through higher taxes.

And all this before the price of crude oil in Canada rises by another $10 a barrel! Ontario voters can hardly ignore the fact that about $4.50 cents of this will accrue to the government of Alberta according to the estimates of the federal government's estimates. In essence, the standard of living of the average Ontario resident, whose income is now about the same as that of the average Alberta resident, and who already pays much higher taxes, is now being asked to pay, through higher gasoline, fuel, and other prices, a substantially higher 'tax' to the government of Alberta. The perverse inflationary and short-term unemployment effects would hardly be ignored either if the Ontario voter (or his political spokesman) decided to justify resisting higher oil prices.

With a progressive income tax and higher per capita incomes, the average resident of Ontario has over the years borne a disproportionate share of the costs of two world wars, equalization payments to 'have not' provinces, the federal half of shared-cost programs, massive corporate tax subsidies to the petroleum industry, and natural gas price subsidies. And the list could be extended ad infinitum. Whatever the merits of these 'facts' from the point of view of economic analysis, they provide powerful ammunition for Ontario politicians.

The prevailing political situation cannot be ignored in considering the Canadian energy issue. The Clark minority federal government is newly elected, inexperienced, and dependent upon the electoral support of both the western provinces and Ontario. The Davis minority government of Ontario seems to maintain a precarious equilibrium, which could quickly be upset by an apparent willingness to accept uncompensated higher energy prices. The Lougheed supermajority government of Alberta is in the strongest bargaining position attainable. And there is, of course, René Levesque's Quebec government, preoccupied by the impending referendum and certainly not anxious to bolster any federal initiatives that would increase Ottawa's credibility with the Quebec electorate.

This situation would suggest that the Clark government can afford to alienate western voters only if the losses there can be offset by additional support elsewhere, particularly in Quebec. The Davis government must support low energy prices unless some perceived quid pro quo for the Ontario voter is secured. The Lougheed government can be completely intransigent in the pursuit of the narrow interest of Albertans and the Alberta treasury.

Summary 1

The physical presence of marketable natural resources within the territory over which a national government has jurisdiction does not ensure that the residents are thereby better off. Unless the resources are sold to non-residents at fair market value or through the imposition of 'optimal' tax rates on the Canadian source income of non-residents, Canadians would be as well off if the resource did not exist or preferably were not exploited. Similarly, but somehow less disturbing, is the possibility that the bulk of the benefits of the collective resource are captured by a few resident individuals. This is primarily a question of equity. Even when the collective benefits are maximized, the question of the 'proper' distribution of those benefits arises in a virulent form, particularily when the resources are concentrated in one geographic area. And when the resource is 'owned' by a constituent part of a federation with jurisdiction in that area an especially aggressive form of greed can threaten the life of the national body politic.

2 Under certain conditions it can happen that a federation makes some of its citizens better off and none worse off. Efficiency gains can be obtained while minimizing the coercion of geographically clustered minorities. However, that does not necessarily happen in a federation. Although the competition among national political parties tends to result in logrolling compensation for regional minorities, persistent majority coercion of geographic minorities can occur, as can the opposite, when the minority has some form of monopoly power, as does Alberta at the present time. Should the coercion take place in either form, and should the federation not collapse as a result, in the long run the movement of residents 'voting with their feet' will restore a rough but inexorable equilibrium.

3 Perhaps not surprisingly the provisions of the Canadian constitution are such that a stalemate has been reached with respect to the distribution of the collective benefits of petroleum resources: the federal and the provincial government can each offset the policy initiatives of the other. There is a wide range of possible strategies extending from blatant coercion of one party by the other to the capitulation of one side or the other before the fight begins. Voter perceptions of the legitimacy of the strategy proposed is all-important in resolving the conflict.

4 Whether it be escalation to coercion or capitulation (or something in between) depends crucially on voter perceptions not only about their constitutional rights but also about their 'rights in equity,' so to speak. Politicians - federal and provincial - must, for their survival at the polls, appear to have pursued the interests of their respective constituents however shortsighted, self-seeking, and self-righteous they may be.

In the tug of war between the provinces of Alberta and Ontario - the biggest oil producer and the biggest petroleum consumer - there is a large divergence between the perceptions of the voters resident in each province: differences in how they see themselves and how they see each other. The declining relative economic position of Ontario and the all too obvious affluence of Alberta mean that it would be politically suicidal for politicians in Ontario to appear to accede to a further deterioration in the economic position of Ontario voters for the benefit of cash-burdened Albertans. The number of Ontario seats in Parliament compared to the number of Alberta seats dictates that the perceptions of Ontario voters be, to put it mildly, treated as consequential.

The political realities involved in the energy issue include voter perceptions about their legal rights and their 'rightful place' and about the impact of alternative policies on their interests.

Suppose that Canadians sought to maximize their aggregate real income while maintaining roughly the same interpersonal and interregional distribution of income. Given the dramatic increase in world oil prices, how would the policies that would be optimal for a unitary state need to be modified to suit the realities of Canadian federalism? To that question I now turn.

THE MODIFICATION OF OPTIMAL ECONOMIC POLICIES UNDER CANADIAN FEDERALISM

To isolate the federal-provincial dimension of the energy policy issue we begin by assuming that Canada is a unitary state. Then we postulate a set of policies that would maximize both allocative efficiency and the collective benefit from non-renewable energy resources located in Canada. The distribution of this benefit among all Canadian residents is considered below.

Using this set of hypothesized policies as a benchmark, we then consider, policy by policy, the modifications that might be involved to accommodate the Canadian constitution. In examining these modifications we shall suppose that Alberta is the only provincial government possessing oil and gas resources and that its government seeks to maximize the share of the collective benefit accruing to the current residents of the province and to their programs. Crudely put, we are setting up a hypothetical policy game with the federal government trying to garner all the windfall gains for distribution to all Canadians and the government of Alberta trying to garner all the gains for the residents of the province.

Political realities are, with a few exceptions, ignored. The term 'proposed policy' is used in a most restricted sense. The reader should constantly be mindful of the rather extraordinary assumptions that in a sense dictate the proposals presented in this part. My 'real' proposals are advanced later.

Roughly speaking, the world price of oil has moved from $4 to $14 to $24 a barrel currently. As is well known, the Canadian price ceiling of about $14 a barrel means that there has already been a windfall gain to Alberta of $10 a barrel. Similar gains have already occurred with natural gas. The effects on the revenues of Alberta have been described. This part does not consider a return to the situation prior to 1973. Rather, it considers the next $10 a barrel increase in the domestic price of crude oil. In other words, half of the windfall gains to date have already been captured. We are not contemplating their recapture, only the question of where do we go from here.

The future supply and demand for energy in Canada

In recent years there has been an unfortunate return to the Malthusian fascination with the apocalyptic consequences of the inevitable collision of projected future demand and supply trends growing at different rates. Like early interpreters of Malthusian population theory, some forecasters have given up in despair or called for extraordinary measures before analyzing the processes of adjustment that are likely to emerge, or could be induced to emerge, to avert the dire consequences.

Of particular importance has been the highly questionable quality of the Canadian estimates of the demand for energy and of the stocks of conventional oil and natural gas. As John Helliwell convincingly argues, the demand forecasts have been, with few exceptions, too high and the stock estimates too low.[7] The overestimate of the growth of the Canadian economy and the underestimate of the price elasticity of the demand for energy have largely accounted for the former. Underestimation of the degree of substitution between different energy sources, and in particular between oil and natural gas consumption in response to changes in their relative prices (the cross-elasticities of demand), has also been a factor. The failure to reflect adequately the crucial role of price in determining the recoverability of gas and oil from known deposits has largely accounted for the latter. In short, by grossly understating the adjustments on both the demand and supply sides that would be brought about by rising energy prices, it has been all too easy to conclude that dire shortages or undue reliance on insecure foreign imports are inevitable unless extraordinary steps are taken to augment supply.

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[7] John F. Helliwell, Annual Energy Review (Ottawa, 1979)

The price elasticities of demand and supply have either been ignored or based on a narrow range of data that provides little information about the effects of large and permanent relative price changes. This being the case, we should recognize our ignorance about the future changes in demand and in supply that would occur if consumers and producers were faced with dramatically higher oil prices. By allowing the price of oil to rise and that of natural gas to fall relatively, as is proposed below we should be able over the next five to ten years to make much better informed and hence more rational decisions concerning the need for unconventional oil or high-cost frontier oil and gas.

Strictly from an economic efficiency point of view, the goal of energy self-sufficiency makes little if any sense. The well-being of the Canadian economy, and hence of the average Canadian, is determined by the economic well-being of our trading partners, especially the United States. If Canada were self-sufficient in energy by, say, 1995, but our energy was for some reason extraordinarily costly relative to the energy costs of other trading nations, the Canadian standard of living would be lower because the Canadian dollar would have to be lower. We would have to export more in exchange for a given level of imports.

To argue against the goal of energy self-sufficiency is not to argue against the provision of some excess capacity to lessen the shock of an interruption of foreign supply. With some contingency stocks and production capacity an orderly adjustment is possible. Increasing our ability to cope with stocks is one thing; trying to make Canada impervious to any and all external shocks for a period of indefinite length is quite another.

The manipulation of international oil flows is now a strategic weapon in the ceaseless struggle among nations in the pursuit of the interests of their citizens, if need be at the expense of others. However, as in international matters generally, Canada is ultimately dependent upon the economic and military strength of the United States.

Whatever the additional costs Canadians bear in an attempt to achieve energy self-sufficiency, and they will be extremely high, we cannot isolate ourselves from an energy crisis that brings the American economy to a standstill. If the American economy were to be sick unto death the Canadian economy would be dreadfully ill. If the American economy went down hill the American defence capacity would falter. If that capability faltered, Canada would be hopelessly vulnerable and the more ripe for the picking if we had abundant energy - albeit obtained at great cost. And there can be no doubt that the pursuit of energy self-sufficiency would be extraordinarily costly in terms of other opportunities forgone.

This emphasis on Canada's dependence both economically and militarily on the United States should not be construed as an argument for a continental energy policy. Canada has an energy advantage. We should neither give it away nor lose it. My concern is that in pursuit of the will-of-the-wisp of energy self-sufficiency Canada will fail to put its initial advantage to good use. For over a century generations of Canadians have paid a significant price to be different from their southern neighbours. I believe that the opportunity to be different is worth something. But there is no virtue in paying a higher price than necessary. If Canadians use their advantage to advantage they will be wealthier. And to paraphrase the late Harry Johnson, there is nothing like more wealth to make one more independent!

The political attractiveness of an energy self-sufficiency policy for Canada is obvious. It appeals to the voter's anticipation of the smug delight he will feel in being able to say to those in trouble 'I'm all right Jack.' While such feelings may be shoddy, if painfully human, they cannot be bought cheaply. Moreover, from the point of view of a politician searching for votes the self-sufficiency goal exudes an aura of clear national purpose and a 'take-charge' attitude as Canadians are led into the war against lineups at the gasoline-pumps - lineups that would disappear if higher prices were allowed to fulfil their rationing function. Imagining mammoth synthetic oil producing or heavy oil processing structures rising like steel pyramids in the Canadian wilderness imparts a delightful feeling of self-satisfaction. These steel and concrete monsters would symbolize our standing strong and resolute in the wilderness in defiance of the elements.

Few of those who endorse the energy self-sufficiency goal are aware of the costs that Canadians collectively will have to bear to achieve it. Nor have many thought through its inherent futility as a means of protecting the nation for all time against external energy vicissitudes. Moreover, if the energy self-sufficiency goal is unlikely in the end to provide collective benefits commensurate with the collective costs, it will certainly provide large and unequivocal benefits to the few.

About one hundred years ago some eastern industrialists (e.g. Massey and Gooderham) made fortunes from Sir John A Macdonald's so-called national policy. Foreign investors became notably enriched by capturing (through the precursors of such corporations as CIP, Reed, and INCO) the public domain (especially timber and mineral rights) in eastern Canada for their private benefit. Under the energy self-sufficiency banner we now seem on the verge of granting the supranational petroleum corporations, which have already done more than nicely with Canadian conventional oil and natural gas, another fistful of Canadian assets in exchange for a false sense of independence and some industrial monuments.

The ultimate futility of striving for Canadian energy self-sufficiency, unless the United States either follows suit or obtains security of supply in some other way, is not affected by the Canadian federal system. Nevertheless, under the current synthetic oil and heavy oil upgrading proposals all Canadians would bear the extra costs of such a policy in the form of higher prices and in massive federal tax expenditures (taxes forgone). All Canadians are unlikely to share in the 'benefits.' The producing provinces are certain to collect royalties. The Canadian assets held by non-residents are likely to increase. The federal treasury may never collect any tax on behalf of Canadian residents generally.[8]

Energy self-sufficiency is of course the perfect policy from the point of view of producers. Concessions are offered with abandon without any careful appraisal of their effectiveness. A needlessly large part of the collective benefit is captured by the industry, which is overwhelmingly owned and controlled by the few supranational oil companies.

The petroleum industry throughout the world is dominated by a relatively small number of extraordinarily large corporations. The fact that none of these corporations is Canadian-controlled is not of great moment, for it is doubtful that their decisions reflect much concern with maximizing the interest of any particular nation. Rather they might better be thought of as maximizing their respective corporate interests, individually and severally, on a long-term world-wide basis. Of particular importance in the present context is the power these corporations possess to shift petroleum exploration and development activities around the world in a highly strategic manner. That is to say, the corporations do not take national tax regimes as given. They can withhold or withdraw exploration and development investment from a particular nation that has petroleum potential in order to induce the nation to adopt a favourable tax regime. This strategic power, in effect the power to blackmail and coerce national governments, arises to a large extent from an ability of the corporation to divert large flows of funds internationally and quickly put together (or take apart!) investment projects of great size. But it also arises because they have a virtual monopoly of the best technical information and skills related to all aspects of petroleum exploration, development and marketing. This certainly includes geological, geophysical, and petroleum engineering knowledge and expertise. It also encompasses the legal, accounting, economic analysis, and public relations fields nation by nation. One might well argue that co-opting the latter is more important than monopolizing the former.

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[8] The Ontario treasury also suffers because the major refineries are located in Ontario and their corporate income is reduced by the deduction of expenses incurred in the non-conventional oil projects.

The international petroleum companies are able to deploy their tactical advantages and their monopoly of knowledge and expertise through well-orchestrated and well-financed pressure group activities. These activities are made more effective by encouraging the existence of relatively small, ostensibly independent, corporations controlled by nationals. The policy demands of the latter are likely to generate automatic support from the national business community. Moreover, they create the illusion that what is in the interest of the Canadian independents must also be in the national interest. This tends to mask the fact that what is in the interest of the domestically controlled independents is almost invariably also in the interest of the large international corporations - interests that are overwhelmingly greater in magnitude. The interests of the latter are often not at all in the national collective interest.

Anyone who doubts the effectiveness of the petroleum lobby is advised to read Meyer Bucovetsky's article on the mining lobby's behaviour over the Carter Commission's recommendations concerning mining tax reform.[9] Can anyone doubt that what the mining lobby can do the petroleum lobby can do better? The group of integrated petroleum corporations being smaller, the 'free rider' problem that reduces the effectiveness of most special interest groups is negligible with the petroleum lobby.

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[9] Meyer Bucovetsky, 'The mining industry and the great tax reform debates.' In A. Paul Pross, ed., Pressure Group Behaviour in Canadian Politics (Toronto: McGraw-Hill Ryerson, 1975, chap. 5

Pricing to induce conservation and substitution

Few economists would disagree with the proposition that, when there are many buyers of a particular good or service that has many uses, an increase in its relative price is the most efficient means of inducing a reduction in the amount taken, in part because of the substitution of other cheaper goods and services for it. The world price of crude oil began to rise sharply after 1973 as a result of OPEC cartellization, perhaps reflecting an increased awareness by the oil exporters of the fact that their known conventional oil reserves were being rapidly depleted at a low price that restricted the economic recovery rate. Whether contrived or not, for Canada as for so many other nations, the world supply of crude oil has become increasingly scarce relative to the demand for it. Alternative sources of energy have, therefore, become more valuable. Artificially depressing energy prices in Canada by about $10 a barrel below the world price of approximately $24 a barrel through an oil export tax and an oil import subsidy undoubtedly means that more is consumed in Canada than would be consumed if the world price prevailed here.

We are importing more oil than we would if world oil prices prevailed in Canada. Leaving aside foreign borrowing, these imports depress the value of the Canadian dollar. This means we have either to export more goods and services that we could otherwise consume ourselves or import less. We 'pay' in lost satisfaction from these extra exports or reduced imports more than we gain through subsidized oil consumption. (Helliwell, see note 7, 175-225).

No doubt in the short term the quantity of oil taken is insensitive to changes in its price (the price elasticity of demand is close to zero) because the degree of substitution is extremely low. The capital costs of switching from one form of energy to another are high, as are the immediate costs of substituting, say, mass transit for the private automobile. The location of residences and work places relative to each other are also costly and time-consuming to alter. Nevertheless, it is equally obvious that in the long run a substantial degree of conservation and substitution (e.g. home insulation) would take place were the price of oil to rise and remain relatively high.

Any rationing by fiat (coupon) scheme would be much less efficient, in part because of the administrative costs involved and in part because administrative allocation presumes a degree of detailed foreknowledge of changing demands that simply does not exist. Localized surpluses and shortages are endemic under such rationing systems. Sporadic shortages mean lost production, and hence waste, not to mention frustration.

It follows, therefore, that to induce more efficient use of scarce oil the price of crude oil in Canada should move quickly to the world level. At that level there would be no need to regulate oil exports to the United States, where the price of crude oil is expected to remain below the world price at least until 1981, except to ensure that Americans do not substitute secure Canadian imports for other offshore imports, thus increasing Canada's reliance on the latter.[10] Because it seems virtually certain that the world oil price will not fall in real terms and may well continue to rise, Canadian investors should be assured that oil price ceilings below the world price will not be re-established in future in Canada. This added certainty with respect to future Canadian policy would lead investors to seek ways to minimize the impact of persistently higher-priced oil and tend to encourage the capital investment required to substitute other energy sources for oil.

Canadian annual domestic crude oil consumption is now about 700 million barrels. At a Canadian/world price differential of $10 a barrel, the total subsidy to Canadian consumers is obviously about $7 billion. The Department of Energy, Mines and Resources estimates[11] that a one dollar increase in the Canadian price results in a revenue distributed approximately as follows: producers 45 per cent; Alberta 45 per cent and the federal government 10 per cent. Ignoring oil imports for the moment, the annual 'contributions' to the current consumer subsidy are therefore: producers $3.2 billion, Alberta $3.2 billion, federal government $0.7 billion. These might be thought of as the current rents forgone. Under a unitary state a move to the world price would mean that, as consumers, Canadians would lose a subsidy in 1978-9 of about $7.0 billion, but as 'co-owners' of the federal purse they would in a sense gain roughly $3.9 billion. (Under a unitary state Alberta's $3.2 billion would be added to the federal $0.7 billion.)

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[10] In any event, the rapid phase-out of Canadian net oil exports seems eminently sensible and should be explored if the price differential does not have the effect presumed here.

[11] Attachment to a letter from D.W. Scrim, Director General, Financial and Fiscal Analysis, Energy, Mines and Resources, to the author, 18 July 1979.

This is not the end of the story, however. On an out-of-pocket basis the situation is rather different. Leaving aside equalization payments, the net cost of the price ceiling for 1980 to the federal government is estimated as follows:

	$(billion)
Cost of oil import subsidy	1.597
Proceeds oil export tax	(0.651)
Proceeds gasoline excise tax	(0.434)
	512

Assuming that the oil export tax became ineffective and the gasoline excise tax were abolished, the purse of the unitary state would be increased by the $3.9 billion cited above plus this net saving of $0.5 billion for a total of $4.4 billion. The disposition of these additional government funds is considered later.

One simple but frequently forgotten point needs to be made. Although it is a convenient abstraction to speak of an allocation of the rents among producers, governments (provincial and federal), and consumers, all rents ultimately are captured by individuals. Investors (through higher share prices or dividends), employees (through higher wages) and suppliers to the industry (through higher prices) capture the producers' share of the rents. Provincial residents and Canadian residents (through lower taxes, improved government services, or transfer payments) capture the government share of the rents. Individual consumers capture the rents through prices that are below market for oil and its derivatives. Corporations and governments, of course, are forms of organization. Such abstractions cannot benefit from the rents just as they cannot suffer from a tax - a matter to be discussed shortly.

1 Natural Gas

There are, in essence, two regulated prices for natural gas in Canada : the Toronto City Gate price and the export price. The former is equal to about 85 per cent of the domestic price of crude oil in BTU equivalent terms, and the latter is significantly above the former. On efficiency grounds it is tempting to propose that the price of natural gas, for both domestic and foreign consumption, be the same as the world price of crude oil in BTU equivalent terms. This temptation too should be resisted. Equivalence in terms of BTU's does not necessarily mean equivalence in substitution given existing technologies. A BTU embodied in a gallon of gasoline is not equivalent in use to a BTU embodied in coal. Only if the relative prices of oil and gas are permitted to change in response to market forces will we know their economic equivalence in use. (We do not expect foods to sell at calorie-equivalent prices!) This suggests that, to induce greater substitution, if the price of crude oil in Canada were allowed to rise to the world level the price of Canadian natural gas for domestic consumption should be allowed to find its own 'competitive' level. That is the proposal advanced here on efficiency grounds.

Natural gas distributors are natural monopolies. It would be important to ensure through rate regulation that the corporations that distribute natural gas were not able to capture monopoly profits by restricting volumes in order to raise natural gas prices. It is proposed on efficiency grounds that natural gas pipeline operators be required to function solely as common carriers and be regulated on a rate-of-return basis. It would then be possible for bulk purchasers of natural gas to enter into contracts directly with the producers. Gas distribution corporations would continue to be regulated on a rate-of-return basis like pipeline operators.

But what of natural gas exports? Clearly, if neither export volumes nor the domestic price were regulated, natural gas would not sell in Canada below the price at which it could be sold in the United States. And the US price is established by regulation as the BTU equivalent of the world crude oil price. Since Canadian producers have excess reserves at the present time, the complete deregulation of Canadian natural gas prices and volumes might well result in rapidly rising Canadian gas exports priced somewhat below the US domestic gas price. The same price would almost certainly prevail in Canada. The result would be that Canadian gas would be 'given away' in the United States and the price of Canadian gas in Canada would be almost as high as it would be had the Canadian gas price been fixed at the world crude oil BTU-equivalent price. Canadian natural gas producers would enjoy a large windfall if royalties were not increased.

The straightforward route out of this impasse would be to levy a flexible natural gas export tax ensuring that Canadian natural gas sold in the United States at a price somewhat above the US price at all times - a premium that can be justified in security of US supply terms. No control over the volume of Canadian gas exports would then be required. (It should be recalled that complete self-sufficiency has been rejected as an unattainable goal.)

A floating domestic price for natural gas and a gas export tax that more than made up the difference between the Canadian and US prices would, in the absence of gas royalty increases (a matter discussed later), deprive Canadian producers of most of the windfall gains they otherwise would obtain by virtue of the higher world crude oil price. More important, it would allow the Canadian price of natural gas to fall compared to the price of crude oil priced in Canada at its world level. This decline would encourage the substitution of gas for oil.

In the long run there is no justification on efficiency grounds for selling natural gas in Canada at a price below the unregulated US market price. Subsidized domestic gas prices would be a most inefficient method of improving the international competitive position of Canadian industry. Unless there were firm evidence that gas producers in both countries had an inordinately high discount rate or persistently underestimated future prices, there would be no economic sense in hoarding gas for some future period. If they can yield more than the real interest rate, capital goods that are imported now in exchange for natural gas exports are more valuable than having more domestic gas some time in the future.

2 The oil trading agency proposal

One of the barriers to implementing the pricing scheme just described is the cartel-like nature of Canadian oil production and refining, which is completely dominated by a few supranational giants. Another is the natural monopoly characteristics both of oil and gas pipelines and local gas distribution systems in both Canada and the United States. Furthermore, the terms and availability of our oil imports are ultimately determined by foreign governments. Workable competition does not prevail in vital parts of the oil and gas industry. Nor is there reason to believe that unilateral action by the government of Canada could bring it about.

Under our unitary state assumption one way of minimizing the impact of the lack of competition would be to create a national oil and gas trading agency that would, in effect, act as the monopoly buyer and seller of crude oil. The trading agency would negotiate all long-term crude oil purchase contracts with the agencies of foreign governments and purchase all domestic crude oil by tender. It would sell all crude in Canada at the world price. Collusive attempts to withhold domestic oil and gas supplies could be thwarted by ensuring that competitive bids were submitted by a government oil production agency (e.g. PetroCanada). By purchasing all western crude oil by tender and selling it at the price of offshore crude, plus or minus the difference in transportation costs, all of the rent element rising from increasing prices would be captured from producers by the state trading agency.[12]

Without a dynamic econometric model it would be futile to try to estimate the long-term annual gross profit of such an oil trading agency. Even then only estimates based on alternative world price assumptions would be possible. About all that is clear is that in the short term the 'profit' from oil would be approximately equal to the prevailing annual gross subsidy of about $7 billion (700 million barrels times $10) less the net cost of the subsidy of about $0.5 billion set forth earlier.

There is no doubt that in principle the proposed oil trading agency could be established in a unitary state. Assuming this means of capturing the petroleum rents were optimal, what are the barriers to the implementation of the proposal in Canada? Because Alberta claims all the rents, the national trading agency proposal would, to say the least, cause screams of outrage from that province and possibly from British Columbia and Saskatchewan. The constitution would not seem to constitute an impediment if the agency were to exclude from its ambit oil and gas produced and consumed within a province. Federal jurisdiction over oil exported from a province and foreign oil imports seems absolutely clear.

The producing provinces could retaliate in three ways. First, they could restrict output, thereby necessitating larger foreign imports. The collection of the rents would be postponed and the profits of the national trading agency deferred. The second stratagem, one already being employed to some extent, would be for the producing provinces to agree to 'sell' for next to nothing oil and gas to petrochemical and other potential industrial energy users located in the province. This second stratagem, one already being employed to some extent, would be for the producing provinces to agree to 'sell' for next to nothing oil and gas to petrochemical and other potential industrial energy users located in the province. This would make firms heavily dependent upon oil or gas non-viable if located outside the province unless a federal subsidy were provided that offset the higher national price. As indicated before, the subsidization of Canadian industry by means of energy subsidies is most inefficient.

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[12] The national trading agency would function in some respects like the British Columbia Petroleum Corporation except that it would purchase domestic oil and gas by tender and not offer to purchase them at a fixed price.

Another, and probably the simplest, riposte the producing provinces could adopt would be to raise oil royalties by about the difference between the prevailing price and the world price. The non-deductibility of provincial royalties for federal corporate tax purposes would mean that the federal corporate tax take would not suffer thereby. Nevertheless, to the extent that higher oil royalties were passed on in the higher prices at which oil was tendered to the trading agency, which almost certainly would happen to some degree, the main purpose of the national oil trading agency would not be served. Taken together the stratagems available to producing provinces seeking to frustrate its purpose mean that a national trading agency must be ruled out.

There would seem to be two alternatives. The first is a 100 per cent tax on windfall oil and gas profits; the second is an excise tax on crude oil (or products derived from crude oil, a variant we ignore here).[13] The windfall tax is ruled out on administrative grounds. It is virtually impossible to determine operationally the 'extra' profit of a large, integrated oil company arising from unanticipated price increases because it produces indistinguishable 'new' and 'old' oil. A modified excise tax (decribed presently) on domestic crude oil equal to the difference between the current wellhead price and the landed price of foreign crude would be infinitely more straightforward to administer. Such an excise tax would not preclude the provinces from reducing output. It would, however, place a lower bound on the energy subsidy provided to provincially located industries. It would be proof against attempts by provincial governments to capture the rent through higher royalties. It would be proof against provincial 'nationalization' of the oil industry.

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[13] There is a temptation to adopt differential prices for oil derivative products to mitigate hardships (e.g. lower prices for home heating oil). This is much less equitable and efficient than the approaches discussed later to meet the hardship problem.

As we have seen, an excise tax of about $10 a barrel would not affect appreciably the present growth of the Heritage Fund. Ignoring the effect of our natural gas proposals on provincial revenues, the excise tax would hold the growth of the Fund to what it would have been if the world oil price were to be fixed at about $13 a barrel, which is roughly $10 a barrel more than it was when most of the exploration and development of the current resources took place.

If the oil import subsidy were removed and the domestic crude oil price deregulated there can be no doubt that the price of domestic crude oil in Canada would quickly rise to the world level (adjusted for transportation costs). The domestic oil producers would, in effect, tax the Canadian consumer an additional $10 a barrel. By imposing a federal excise tax, all the proceeds would accrue to the federal treasury rather than 10 per cent - the balance being split evenly between the producers and the provinces. The incidence of the federal excise tax would be the same as the implicit tax resulting from the move to world prices. Some oil purchasers would pass the tax forwards in the form of higher prices for the goods and services they sell or backwards in lower prices for other goods and services they buy. Some of the burden would be shifted to non-residents; part would be borne by Canadians.

Generally speaking, if the price of oil rose sharply as a result of the tax, unless the money supply were increased the prices of other things would have to fall absolutely or more unemployment would result. For reasons that need not delay us here, prices are inflexible downwards, at least in the short and medium term. To avoid additional unemployment we could expect that the money supply would be increased and the general level of prices rise more rapidly. If the Canadian inflation rate were no greater than the US inflation rate and if the world price of oil did not rise further in US dollars (probably an unrealistic assumption), the price of Canadian oil including the tax would decline in real terms with domestic inflation. However, this is a stabilization policy issue that falls outside our terms of reference.

Although the wellhead excise tax is by far the simplest method of collecting the $10 a barrel rent that would be generated by moving to the world oil price, unless modified the tax would create a signficant problem.

Bygones being bygones as far as investment is concerned, the imposition of the tax would not affect the conventional extraction of conventional oil from known pools. If it pays the producer to extract a barrel of oil at $14 a barrel it will pay him to do so if the after-excise tax price is still $14 a barrel. As for the future rate of investment in exploration and development, the excise tax would be capitalized in the prices bid for land - the expected after tax rate of return would be unchanged. The investment rate would therefore not be significantly affected. What would be affected, and this is cause for serious concern, is the extra investment and operating costs involved in secondary and tertiary recovery from known pools. Fourteen dollar oil will warrant the additional expenditure of up to $14 a barrel to recover it from the pool. Obviously $24 a barrel oil will warrant additional expenses to recover additional oil from the pool. This is of the greatest importance because when crude oil is cheap it only pays to recover a relatively small proportion of the known pool, and conversely.

To circumvent this serious difficulty it is proposed that a tiered excise tax schedule be established. The $10 levy would apply across the board, but with these vital exceptions: operators extracting oil from a particular pool would be eligible for a reduction of say 50 per cent in the excise tax on the crude oil produced from the pool if they could establish that secondary extraction methods were being applied to that pool and the reserves recoverable by primary extraction had in fact been extracted. Furthermore, if they could establish that tertiary extraction methods were being applied to the pool and that the additional reserves recoverable by secondary extraction had indeed been extracted, the excise tax would be waived altogether on this third-tier oil.

While I am no expert in the matter, it is my understanding that pool-by-pool differentiation is not impractical and it should not be impossible to arrive at some reasonable and straightforward criteria for determining the use of secondary and tertiary recovery methods. If this is the case, the scheme proposed, although no doubt rough and ready, would seem to me to be infinitely better than an attempt to tax windfall profits and much better than an undifferentiated excise tax rate. The additional conventional oil recovered from known pools at the world price with zero excise tax would be much cheaper than unconventional oil. The supply response to higher prices through secondary and tertiary recovery could dramatically change the Canadian conventional oil supply picture.

As already stated, whether in a unitary state or not, the price of domestic natural gas should be deregulated in the expectation that, at least for five or ten years, its price would fall (relatively) below the 85 per cent BTU-equivalent world price of oil that now prevails. It would be counterproductive, therefore, to impose a comparable excise tax on natural gas destined for the domestic market. The purpose we seek to serve through the deregulation of domestic gas prices would be frustrated, however, if the provincial gas royalty were raised. To preclude the gas royalty price hike the federal government could provide for a punitive gas export tax: increases in royalties would trigger a confiscatory increase in the gas export tax. This would be so damaging to the producers that a province would be bold indeed to increase its gas royalties. Infinitely better would be a sharing of the proceeds of the gas export tax with the province, avoiding the need for such a punitive provision. This sharing arrangement is discussed in the next part.

Circumscribing the role of pipeline companies to that of common carriers - which would permit large buyers to bargain directly with sellers - would seem to answer the problem of pipeline operators collecting the rents.

The exploration and development of conventional crude and natural gas

This section considers non-frontier conventional oil and gas; frontier exploration and development and non-conventional oil will be dealt with later.

At present an incentive tax system is the principal policy instrument for encouraging exploration and development. Rights to explore and produce oil and gas from crown lands (we ignore freehold mineral rights) are in effect auctioned. These costs are deductible as development costs for corporate tax purposes. Exploration expenses are immediately deductible. Development costs are deductible on an accelerated (30 per cent) diminishing-balance basis. Currently these costs can be deducted against income from any source. The resulting tax postponement is essentially an interest-free loan of the taxes postponed. It is obviously enormously valuable. Furthermore, resource profits (a defined term) are reduced by a resource allowance of 25 per cent and by an earned depletion allowance of up to 25 per cent based on one-third of actual exploration and development expenses. The latter amounts can be carried forward if not claimed against current resource profits. The resource allowance was granted in 1974 as a rough quid pro quo for the decision to disallow the deduction of provincial royalty payments for federal corporate tax purposes.

Under a unitary state the deductibility of royalties could be resumed and the resource allowance abolished. Indeed, under a unitary state with a national trading agency, if all mineral rights were crown-owned and all exploration and production rights were sold at auction, the rationale for a royalty charge would largely disappear.[14] Rights to explore and produce oil and gas from crown lands are now sold at auction, and, assuming no collusive bidding, royalty rates and the corporate tax are capitalized in the prices paid to the crown to yield an after-tax rate of return comparable with other investments of the same risk. Thus through capitalization in land prices the province recaptures all federal corporate tax incentives in higher land prices, assuming that oil and gas prices do not rise unexpectedly after the bidding takes place. It follows, therefore, that, with some exceptions to be discussed below, no corporate tax concession designed to encourage petroleum exploration and development can be effective.

Abolition of the earned depletion allowance would result in a windfall loss to exploration and development corporations because of the consequent reduction in the value of the land already acquired. In future the loss of the concession would be capitalized in lower bids for exploration and production rights.

The increase in the effective tax rate through the withdrawal of the depletion allowance would reduce the corporate funds available for investment by reducing retained earnings. It is difficult to assess the materiality of this effect on future investment. If the self-imposed constraints of management concerning the maintenance of control were not at issue, the ready access to funds in the capital market for corporations with resource profits would make the resulting reduction in their cost flow of little importance. But the managerial constraints are real. Presumably, and not surprisingly, executives are risk-averse when it comes to decisions that could affect their own positions. They are seemingly willing to accept a lower rate of return on corporate investments that can be financed through retained earnings. However, this problem (if such it is)is not unique to the petroleum industry .

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[14] However, as Bucovetsky has shown, a royalty system does encourage exploration because the state in effect shares the risk, M.W. Bucovetsky and Malcolm Gillis, 'The design of mineral tax policy.' In M. Gillis et al., Taxation and Mining; Nonfuel Minerals in Bolivia and other Countries (Cambridge, Mass: Ballinger, 1978), 103).

The joint venture arrangements prevalent in the petroleum industry allow a pooling of risk that cannot usually be achieved in most non-resource industries. There is therefore no a priori argument in favour of tax concessions of any kind to offset the riskiness of exploration even if one could be imagined that would not be capitalized in higher land prices.

Because the earned depletion allowance is offset by the capitalization of the benefit in higher bids for land, there is no reason to believe that the earned depletion allowance induces a level of investment in oil and gas that is too large relative to the investment in other industries subject to higher corporate tax rates. However, because it is only applicable to 'resource profits' the earned depletion allowance creates a barrier to entry for corporations not already established in the production of oil and gas. This is an important consideration because it sustains and strengthens the cartellized, foreign-dominated petroleum industry structure.[15]

Perhaps the most decisive evidence that the major petroleum corporations face no cash shortage is the recent spate of acquisitions. The major internationals have been acquiring control of other corporations, many of which are outside the energy sector. If the tax royalty regime were judged to be inhospitable, the exploration and mineral rights sold by the province would be zero. In fact, the prices received have rocketed upwards. This suggests that the industry finds them exceedingly comfortable at present, given projected oil prices. If the corporations were anxious to invest more in oil and gas but were cash-poor they would not be diversifying. The argument for the withdrawal of the federal earned depletion allowance on future conventional oil and gas exploration and development therefore seems unassailable whether in a unitary state or not.

What is abundantly clear is that, given the existing Canadian situation, federal corporate tax concessions are ineffective in stimulating exploration and development. What is more, the federal revenues forgone are essentially captured by the provinces through higher land prices. The allowances create a barrier to entry into an industry already plagued by bigness. Because the allowances lower the effective tax rate, they increase retained earnings. Foreign-owned corporations are therefore able to expand in Canada in the petroleum industry and elsewhere by virtue of the Canadian corporate taxes forgone. The Canadian taxpayer is making a gift of Canadian assets to non-residents. On efficiency grounds it is therefore proposed that the earned depletion allowance be gradually phased out by denying it for future exploration and development expenses.

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[15] Indeed, all fast-writeoff incentives create a barrier to entry for new enterprises that do not have current income against which these expenses can be deducted. The delay in obtaining the deduction is extremely costly.

Non-conventional oil

It was argued earlier that higher crude oil prices in Canada will restrain future demand and increase the recovery of conventional crude from known pools. Until the magnitude of these responses is known it would be premature to undertake extraordinary measures to increase the domestic oil supply on the basis of efficiency considerations. As with the information derived from frontier exploration, however, a case can be made for public subsidy of the development of the technology of synthetic oil extraction from the tar sands and for processing heavy oils to obtain a product that is roughly substitutable for conventional crude. The justification is the same: to a considerable extent the technology has public good characteristics that probably preclude the private investor from capturing through product sales the costs involved. There is no doubt that unless the price of conventional crude is astronomically high, synthetic crude can not be produced on a large scale with existing technologies without massive capital or other subsidies.

It would therefore appear that investments beyond the pilot plant stage are not justified under the efficiency criterion except as a hedge against the sudden loss of foreign crude oil and against the possibility that higher oil and lower natural gas prices will not induce substantial demand and supply responses in the longer term. These are not trivial exceptions, of course. Although the financing arrangements of the several extant tar sands and heavy oil projects differ one from another, it is worthy of note that the latest Alsands proposal by a consortium headed by Shell Oil involves the federal and provincial treasuries forgoing taxes otherwise payable on the current flow of resource profits of the consortium members until all the investment costs are recovered. Thus the Canadian public would provide about one-half of the requisite $5 billion in capital without cost to the consortium. The market for the output would be assured, and the world price for the output would be guaranteed.

If one looks upon the potential after-tax and royalty profit to be garnered from a public gift of say, $2.5 billion of fixed assets as a management fee, one might well ask whether the proposed arrangements are the least costly from the point of view of the public purse.

Doubt has already been expressed about the economic wisdom of proceeding much beyond the synthetic oil projects already launched until Canadian conventional oil prices have been allowed to rise to world levels and have remained at those levels for a sustained period. However, should it be deemed desirable to proceed from an abundance of caution, the concessionary financing proposed by the petroleum industry seems much more than generous. Because much of the capital would be public, it would seem not inappropriate to have public ownership, although cost overruns on public projects are notoriously large and common.

An alternative would be the contingent repayment loan scheme, which would have the following features:

- each non-conventional project would be established under a new and distinct corporation;
- for every dollar invested by the shareholder in the corporation the government would lend, say, five dollars;
- when, and only when, the corporation's cumulative after-corporate-tax income[16] exceeded the sum the shareholders had invested prior to the generation of income would interest on the government loan be charged and the loan become repayable on an amortized basis;
- the interest rate and the amortization period would be concessionary if necessary.

Such a scheme would 'solve' the financing problem yet limit the concession for successful projects to the interest forgone and the favourable interest and repayment terms. Under the scheme proposed above, the public purse would bear a disproportionate share in the loss of unsuccessful ventures but would not share in the gains from those that were successful.

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[16] The corporation in calculating taxable income would be allowed to deduct only that portion of the capital costs financed by shareholders either by way of share purchase or loan redemption.

Still another alternative would be a government guarantee of a premium price over the world price, with no excise tax being levied. While attractive in its simplicity, this method probably would not suffice to overcome the problem of the lack of 'up front' cash for projects the capital market judges to be quite risky.

Either method of subsidizing the projects would seem infinitely preferable to the arrangements proposed by the consortium - unitary state or no unitary state.

The present consortium proposals might be characterized as follows: the federal government (and some provincial governments too) should put up billions of dollars through forgoing taxes. The provincial governments of the producing provinces eventually collect royalties. The federal government may never collect a penny of corporate tax if the profits are reinvested in other projects. The supranationals reinvest the profits earned on the basis of the taxpayers' assets in order to purchase additional Canadian assets. The contingent repayment loan scheme, or some alternative scheme with similar attributes, is desperately needed. To repeat: in this industry a gift from the federal treasury is largely a gift from the Canadian taxpayer to non-resident shareholders of supranational companies and to the treasuries of the producing provinces.

Frontier exploration

In the absence of government controls the rate of depletion of known reserves depends upon the producer's discount rate and the expected future price of the output. The world price of crude oil, as modified by Canadian and American policies, is the crucial determinant. The costs of exploration, development, production, and transportation of arctic and offshore crude are so enormously high that unless extremely large reserves are discovered and the world price is also extraordinarily high (and not blunted by government controls) frontier oil is likely to cost in real terms more than the imported oil it would displace. This is especially so for frontier natural gas, because large and much more accessible reserves are available elsewhere. Why then the frontier exploration allowance that allows an unlimited write-off against other income of 166.6 per cent of frontier exploration costs? It has been widely reported that under some circumstances a dollar of investment in frontier exploration can now cost the treasury much more than one dollar because the frontier allowance is provided over and above the other allowances and concessions described above.

The reason for the frontier exploration allowance is by no means apparent in terms of economic efficiency. What is being 'bought' with the frontier exploration subsidies is information about the size of the stock of potential reserves that are most unlikely to be used in the foreseeable future if efficiency criteria alone are applied. Because of the public good characteristics (spillover effects) of such information, an element of public subsidy in acquiring it seems justified. As explained before, individual private investors cannot capture all the benefits arising from the information obtained, and without subsidies of some kind too little information may be generated. The information almost certainly could be obtained at a lower cost than by the existing tax concessions.

The contingent repayment loan scheme previously mentioned would accomplish the same purpose at lower cost to the public purse. What the additional information is 'worth' in terms of investment opportunities forgone is an open question. What is clear, however, is that, if we put aside for the sake of discussion the land claims of native peoples in the far North, under a unitary state all the net collective benefits of offshore oil and gas could be collected through a trading agency the profits of which accrued to the national treasury.

The coastal provinces claim all non-arctic offshore mineral rights. This too would be a non-issue under a unitary state.

Although the offshore mineral rights question has not yet been settled, if those rights were transferred to the coastal provinces and commercial extraction took place, the prospective battle over resource revenues would be the same as the present federal/Alberta tug of war over revenues. It does not seem to occur to Albertans, and one might ask whether it would occur to the residents of the coastal provinces either, that without the massive federal tax expenditures embedded in the past corporate tax treatment of petroleum and natural gas the exploration and development upon which current oil and gas provincial revenues are based probably would not have taken place at all!

Royalties

Under the Canadian constitution and with federal reliance on the corporate income tax as an important means of finance, the federal disallowance of provincial royalty payments as an expense is inescapable. Without such a disallowance the province could unilaterally capture all of the rents resulting from unanticipated price increases by increasing royalties (these would not, of course, have been captured by the province in earlier land sales).

Because the federal government must not allow provincial royalties as an expense in calculating corporate taxable income, is the resource allowance necessary as a rough offset? Leaving aside the politics of the matter, the answer is unequivocally no. Like the earned depletion allowance restricted to 'resource profits,' the resource allowance, which is similarily restricted, encourages corporate concentration. Leaving aside the cash flow implications, like the earned depletion allowance it serves no useful purpose in encouraging future exploration and development because the net effect of the disallowance of royalties and the positive resource allowance are being capitalized in higher land prices to the benefit of the treasuries of the provinces.[17]

Having said this, however, it must be admitted that royalties are as legitimate a business expense as any other. The disallowance effectively doubled a corporation's total royalty expense - an expense that Alberta substantially increased with respect to 'old' oil after 1973. Nevertheless, the net effect of the unexpected price increase for oil, combined with these offsetting royalties and tax changes, undoubtedly was positive: witness the dramatic increase in land prices (recall too that the other tax concessions remained unchanged).

There is no painless and elegant solution to this tangled situation. But it should not be perpetuated indefinitely. In this spirit I therefore proposed that:

- the federal resource allowance be withdrawn;
- the disallowance of provincial royalties be continued until the government of Alberta rolls back its royalty rates to pre 1973-4 levels and freezes them at that level;
- should the province agree to this rollback and freeze of royalties the federal excise tax would be increased by an amount necessary to compensate the province fully for the revenues lost as a result.

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[17] It must not be forgotten that these land costs are a deductible expense for corporate tax purposes.

It is the intention of this proposal that the flow of oil rents accruing to the province at this prevailing price of $13 to $14 a barrel be maintained, while at the same time restoring the integrity of the corporate tax both by restoring the deductibility of royalties (albeit rolled back and frozen!) and by withdrawing the resource allowances.

Under a unitary state none of the serious problems discussed in this section would arise. Whether the rents were picked up by land prices, royalties or the profits of a government trading agency would be of little importance because they would all flow into the same pocket.

Public transportation

Although there are undoubtedly many other possibilities, we shall consider as an example one of the most obvious means of conserving oil and gas: the increased subsidization of urban and short-haul interurban public transport and the increased taxation, directly or indirectly, of the private automobile - over and above the establishment of substantially higher gasoline and oil prices. Public transport should be of low cost to the user. It should be safe, fast, convenient, and reliable. Conversely, the private automobile must be made less convenient than it now is and substantially more expensive in American money to the user.

There is little point in making private automobile travel more expensive without providing a viable alternative mode. With the complete dependence of many individuals on the automobile for travel to work, shopping, and school, higher gasoline prices would constitute little more than a revenue-raising tax with no possible behaviour adjustment unless alternatives were available.

With a unitary form of government it would be a relatively simple matter to implement a consistent, integrated public transport subsidy scheme across the nation because municipal authorities, as creatures of the central government, could be instructed to follow a particular course, with direct funding by the central government on the basis of established criteria. With the municipalities being creatures of a province, negotiating the terms and conditions is usually painfully slow and monitoring extraordinarily difficult. Reducing the convenience of the private automobile by, for example, closing certain core areas of cities to them, restricting the number of parking spaces, or raising parking charges to induce the greater use of public transit would be extremely difficult to achieve even within a province!

Nevertheless, as suggested later, despite the difficulties this kind of federal/provincial agreement must be worked out and some of the proceeds of the excise tax allocated to finance it.

Summary

This part of the study has suggested the kinds of modifications necessary to achieve economic efficiency and to maximize the collective benefit from non-renewable resource ownership, modifications arising because of the Canadian federal constitution and the fact that the producing provinces seek to capture all the collective benefit.

Some of the policy changes proposed would seem to make sense whether or not Canada was a unitary state or a federation. Of particular importance in this regard were the suggestions that the earned depletion allowance be phased out and the subsidization of non-conventional oil take the form of contingent repayment loans. The earned depletion allowance is virtually useless as an incentive because it is largely capitalized in land prices. It also encourages industrial concentration in an industry that is already cartel-like. It allows the giant supranationals to acquire Canadian assets with Canadian taxpayers' money. The proposed contingent loan scheme would ultimately be less costly to the public purse and would eliminate the special advantage supranationals would enjoy under the arrangements they are suggesting.

The exploration and development subsidy question is not without federal/provincial implications, however. To the extent that the federal corporate tax incentive is capitalized in land prices, the producing provinces capture the federal incentive but do not share the proceeds of the land sales. Under a unitary state it would not be of significance. Similarily, federal taxes forgone in the financing of non-conventional oil projects may never be recovered. The producing provinces will eventually obtain royalties.

Not surprisingly, the federal-provincial tug-of-war over the division of the collective net benefits from the revenues complicates the capture of the rents from unexpected price increases. Under a unitary system rent capture would be accomplished simply by a state oil and gas trading agency buying for domestic producers by tender and, in effect, selling oil at the world price and gas by auction. Because the provinces could increase their oil royalties and thereby capture all the rents, such a scheme would not work under a federal state without provincial co-operation, which would not likely be forthcoming! For the reasons cited earlier, an excise tax on crude oil levied at the wellhead seems the best alternative. It sidesteps both the royalty issue and the issue of the federal right to tax provincial agencies. The tiered excise tax structure proposed should eliminate the barrier to expanded secondary and tertiary recovery.

The situation with natural gas is less straight-forward, however, because for efficiency reasons its price in Canada should be allowed to find its 'competitive' level and not be dominated by US gas price regulation. If the federal government ceased to control the Toronto City Gate price Alberta could increase its royalties. One 'answer,' which is most unsatisfactory, might be the threat of a punitive increase in the proposed federal export tax triggered by a further increase in provincial gas royalties. However, if the producing provinces were to share in the proceeds of the gas export tax that filled the gap between the market price in Canada and the US price, the producing provinces might agree to freeze their gas royalties. Federal deregulation of the price and volume of gas exports would also be attractive to the producing provinces.

All in all, it would seem that with some ingenuity policy modifications could be devised that would meet our efficiency and collective benefit maximization goals without the use of the most draconian constitutional powers of the federal government if Alberta did not use its own draconian power to restrict output! Had the federal government adopted in 1973 the measures hypothetically proposed in this part, is there any doubt that those draconian powers, or something similar, would have been adopted by Alberta? What is being suggested here is that only half of the total windfall benefit resulting from the price change be captured for the benefit of Canadians generally.

Imagine a simplified Carter Commission type of tax structure that had the following attributes:

- A personal income tax rate of 50 per cent, with corporations withholding tax on profits at the same rate for both resident and non-resident shareholders.
- Resident shareholders credited with taxes withheld at the corporate level.
- Full taxation of share gains (adjusted for retained earnings) on an accrual basis.
- The resource property rights of a province deemed to be held by a

corporation with the residents of the province deemed to be shareholders. The costs of acquisition being zero, the proceeds from the sale of rights and from royalties constitute the income of the corporation; the corporation withholds tax on behalf of residents and remits to the federal government.

(Another variant of the Carter 'approach' would be to deem that each Alberta resident had an imputed income equal to his share of the province's oil and gas revenues, and to require the government of the province to withhold and remit half of these revenues to the federal government on behalf of the province's residents. After all, provincial governments do withhold and remit federal personal income tax on behalf of their employees!)

With such a tax regime the fight over the allocation of oil and gas rents would not be an issue. The lucky winners would keep half of the windfall gains, and the other half would be available to be distributed among Canadians generally in one way or another. (The main loophole, and it is trivial in comparison with the present system, would be the increase in the share prices of foreign-held corporations that could not be taxed by the government of Canada.)

It almost certainly is not possible to implement an 'ideal' tax system. But being aware of it facilitates identification of the source of our problem.

I turn now to consider the disposition of the rents collected for the benefit of Canadians generally as a result of the 'proposals' put forward in this part.

A POSSIBLE STRATEGY

Consider the following 'facts':

1 Since 1973 the world price of crude oil has risen dramatically from about $4 to $24 a barrel, pulling in its wake the price of natural gas.

2 Even though the Canadian crude oil price has only increased by about half that much, the government of Alberta and the oil and gas producers have realized enormous increases in their revenues. The Department of Energy, Mines and Resources estimates that, should the Canadian oil and gas prices remain unchanged, in 1980 the net operating income of producers would be $12.6 billion,[18] shared roughly as follows:

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[18] Clearly all this amount is not rent; net operating revenues would not be zero had the oil and gas price changes since 1973 not taken place.

producers 45 per cent ($5.67 billion); provinces 45 per cent ($5.67 billion); and federal government 10 per cent ($1.26 billion).

3 Not only is the federal 'take' on behalf of all Canadians generally relatively trivial, when the total financial involvement of the federal government in the oil and gas price issue is considered, the following situation is revealed:

Revenues ($ millions)

Corporate Tax	1,380	(as above)
Oil Export charge	651	
Gasoline excise	434	
	2,465	

Expenditures

Import compensation	1,597	
Equalization payments	832	(with respect to petroleum revenues only)
	2,429	
Net Federal Revenues[19]	36	

4 I estimate that in 1980 the rent contribution of Ontario consumers (individuals and businesses) to the net income of producers (assuming no further increase in oil or gas prices) will be as follows:

Consumption		1973-9 price difference	Contribution($billions)
oil	190 mil./B	$10/B	$1.9
gas	700,000 mcf	$1.70/mcf	$1.2
			$3.1

This is roughly 25 per cent of the total net operating revenues of $12.6 billion, as stated above.

Because prices have roughly tripled since 1973, it would not seem unreasonable to suppose that about one half to two-thirds of this figure represents 'rents' - prices over and above costs.

[19] See note 11.

To the best of my knowledge no one has suggested that there should be any reduction in the flow of funds being received by the producing provinces under present arrangements. In other words, the producing provinces would continue to receive about $5.8 billion a year in oil and gas revenues. The Heritage Fund would continue to grow at $1.5 billion a year and so on (declining oil putput being presumably offset by rising natural gas output). The issue is entirely confined to the disposition of the additional $7.7 billion in the net operating revenues of producers (also estimated by EMR) that would result if Canadian oil and gas went to the world level in 1980. (The precise year is not germane to our argument.) With the existing royalty/tax regime in place, the producing provinces would receive an additional $3.6 billion, the producers an additional $3.2 billion, and the federal government an additional $0.9 billion. Ontario consumers would contribute an additional annual amount of about $3.1 billion. The federal net revenue position would be quite transformed, however. It is estimated that the trivial $36 million shown above would rise to $1.3 billion. (This would be the net effect of the following changes: $0.9 corporation tax minus $0.6 export charge revenue plus $1.6 import compensation saved minus $0.6 additional equalization.)

In my view it is indisputable that on efficiency grounds the price of crude oil in Canada should rise quickly to the world level. It is also my view that linking the price of natural gas with the price of crude in BTU-equivalent terms is a serious error. However, leaving that aside for a moment, in my opinion it also would be a most serious error to move to the world oil price under the existing tax/royalty regime. Even under a federal corporate tax system of enormous generosity the producers cannot find profitable investment opportunities in oil and gas at current prices, as the increases in the prices bid for land and their recent diversification moves prove. What public purpose would be served by providing them with an additional annual windfall of $3.2 billion? The fact that the gift would largely accrue to the benefit of non-residents hardly makes the prospect more enticing.

What is needed, therefore, is a rapid move to the world crude oil prices in Canada but with the end of this windfall gain going to producers.

It can be expected that the petroleum industry will threaten to withdraw exploration and development expenditures from Canada in the face of any tightening of the current tax regime. The industry would be less than rational - and in the face of any tightening of the current tax regime it is rational in terms of its own game - not to spend a great deal of money to persuade, cajole, frighten, and threaten Canadians. The stakes are large.

The question of providing an additional $3.6 billion to the producing provinces is even more disputable. In terms of the constitution one might suppose that the case is quite clear that the producing provinces should keep for themselves all the benefits to be derived from their natural resource rights. No doubt the founding fathers expected that natural resource rights would be alienated by the provinces, as was the practice at the time. Under that supposition (proven false in the event) their decision to prohibit taxation by the federal crown of the provincial crown made eminent sense. We reluctantly assume that the federal taxation (on behalf of Canadians generally) of the income from the provincial ownership of all natural resources is not politically feasible in the near term. What follows, therefore, is a kind of second-best 'solution.'

To go back to 1867 (or before?) and try to calculate annual per capita costs and benefits for each province for each federal policy would be as silly as it would be impossible. Almost all those who gained and lost are dead. Children can hardly be brought to account for the evil acts of their forebears, nor do the progeny of those who suffered deserve compensation from those who were not responsible. The policy 'mistakes' of the past century provide no guide to current oil and gas policy.

It would be difficult to argue that the 'average' resident of Ontario would be completely unable to finance an additional increase in his oil and gas bill of about 70 per cent. Conversely, it is equally difficult to argue that Alberta's residents, in general, need the money. They have no sales tax to pay, and their government is already running a surplus that is more than twice as large as the deficit of the government of Ontario with a population about five times larger. But this too is irrelevant. Individuals vote, not averages. To assert that Alberta 'does not need the money' is like asserting that incomes over a certain level (namely one's own) should be taxed at 100 per cent.

Yet there are hundreds of thousands of Canadian individuals and families who have little if any discretionary income. They have to heat their homes and cook their food. In many cases, they have no alternative but to drive to work. Ever higher energy prices for them will undoubtedly be a real hardship. The many voters who believe that they would be put in this position will find it very hard to accept the proposition that they, who subsist from day to day, should be more miserable now in order that the future residents of Alberta be protected against an unlikely (at least in their minds), and distant event - the end of Alberta's energy resources.

If Canada were not an oil or gas producer, the increase in the world price of oil and gas would be a fact to which Canadians would simply have to adjust. (Because of the appreciation of their currencies, both West Germany and Japan - nations entirely dependent upon oil imports - have had little difficulty in adjusting to the increase in the world price of oil expressed in US dollars because their currencies have appreciated dramatically since 1973 compared to the US dollar.) Furthermore, because Canada is energy-rich compared with most other industrialized nations, Canadians have a kind of option. Without obvious dire economic consequences, Canada has postponed the full adjustment. Partly because it was unclear whether the world price change was permanent, partly because the magnitude of the series of increases was unanticipated, and partly for simply political expediency, it was decided to restrict and postpone the adjustment to higher oil prices. For the vast majority of voters the policy has worked extremely well. Fuel is cheap in Canada compared to, say, Europe. And fuel is readily available - which is not true in the United States.

The benefits of postponement of the present policy are apparent; but its real costs in terms of the waste of scarce fuels are little understood. As far as most voters are concerned, higher fuel costs will hurt them and put their money into the pockets of the oil companies, which are conspiring to gouge them, and the province of Alberta, which has so much money it does not know what to do with it. The element of truth in the voters' perception of the consequence of higher fuel costs makes it extremely difficult to persuade them that the real and important hidden costs warrant forgoing the immediate and obvious benefit of low fuel prices. In matters of this kind an ounce of concrete immediate personal benefit is worth more than a ton of abstract future diffused costs - particularly when unknown persons would probably have to bear the costs anyway, if there were any costs.

Premier Davis's reality (and Prime Minister Clark's too) is the prevalence of voters with the views just discussed. Premier Lougheed's reality - a view he shares with virtually all Albertans - is that they have a right to the additional $3.6 billion annually.

Although it would be too much to hope that most voters would not be opposed to higher energy prices, the degree of their antagonism would depend upon their perceptions of the intended disposition of the rents collected. The belief that the higher prices were fattening politicians, bureaucrats, oil companies generally, and foreign investors particularly, would, for example, engender almost universal rage. To that vitally important issue we shall turn in a moment. But let us consider the means of collecting the rents and the magnitudes involved.

1 Rent collection method:

It seems to me that the method of rent collection should be as simple and as transparent as possible in order that there appear to be a simple conduit through which the extra revenues from higher fuel prices are passed to finance progress towards widely accepted goals. The excise tax on oil at the wellhead would serve this purpose and would not deter the investment (and other costs) required to achieve higher recovery rates if the tax rate were to decline from primary to secondary oil recovery and from secondary recovery to tertiary.

As explained earlier, it is proposed that a three-tier excise tax on crude oil at the wellhead be imposed. Having established for each pool the quantity of oil recoverable by primary extraction, that oil would be taxed as extracted at the top rate, say, $10 a barrel. Additional oil extracted from the poor by secondary recovery methods would be taxed at, say, half the rate. When it could be shown that further extraction warranted the investment in tertiary recovery methods, approval would be given to proceed. The additional oil extracted by tertiary recovery methods would not be taxed. Although hardly an elegant 'solution,' in my view it would be better to proceed along these lines than to try to impose an enormously complex windfall profits tax that would force investors to face great uncertainty about the tax consequences of alternative decisions. (It would certainly capture 'rents' for the lawyers and accountants!) A flat-rate excise tax would 'lock in' conventional oil in known pools - quite likely cheaper oil than the synthetics.

Such an excise tax would pose no constitutional problems, and it would sidestep the question of federal disallowance of provincial royalties, a restriction that cannot be lifted until the latter are taxable by the federal government. I therefore propose that the federal government impose (perhaps on a two-year phased basis) an excise tax of approximately $10 a barrel on crude oil at the wellhead, tiered as just explained. Currently such a tax would raise about $5.5 billion annually. It would, however, reduce the federal government's import compensation payments by about $1.5 billion, against which would be offset the loss of the oil export levy yielding about $0.6 billion and the gasoline excise tax yielding $0.4 billion. (The latter is, of course, an independent decision.) The annual net revenues therefore would be about $6 billion. This does not take into account the additional federal revenues that would result from 'withdrawing' the existing ineffective earned depletion incentive to the petroleum industry.

2 Disposition of the proceeds

There are an infinite number of ways to spend $6 billion a year. The alternatives must be assessed both on economic and political grounds, because as just stated, voter perceptions of the merits of what they are getting in exchange for higher fuel prices are all-important. It might be argued, for example, that the revenues should simply be acquired by the federal government in order to reduce its deficit from about $12 to $6 billion (ignoring subsequent effects on GNP). Such a course would be deflationary, but we do not want to consider here whether this would be appropriate at the time the tax would go into effect. Governments now being as unpopular as they are, one might well wonder if the average voter would perceive that his higher gas and fuel costs were justified if the reduction in federal borrowing were the payoff. In any event, I disregard this alternative.

In my opinion the enrichment of unconditional equalization payments to the 'have not' provinces should also be rejected. Admittedly, higher oil prices will raise government operating costs, as they will private costs. But there would seem no reason to compensate governments as such on this basis. Governments should conserve energy too. Provincial governments yearn for the politically costless dollars they obtain from increased equalization payments. They can then 'buy' votes through more generous programs without having to take the blame for tax increases. However, if, as I propose, individuals resident in all parts of Canada receive an income to offset higher fuel costs, the claims of the provincial governments can be rejected. If their residents have the money these governments can raise their taxes should they decide that this were appropriate. In my view an additional dollar of public services is unlikely to yield, or be perceived to yield, as much individual satisfaction as the dollar of private consumption forgone. In short, I think that the rents resulting from a move to the world oil price should be channelled back to individuals; they should not flow to governments to enrich existing programs or finance new programs unless those governments are willing to bear the political cost of rising taxes.

Let us first consider some of the means available for maintaining the disposable income of individuals in part to compensate for higher energy prices and in part to replace the private consumption precluded by the excise tax on oil. To repeat: we seek to prevent an increase in public expenditures at the expense of private expenditures. We seek to distribute the additional rents to the residents of Canada generally.

Heating costs, electricity costs, and perhaps to a lesser extent automobile fuel costs almost certainly represent a larger fraction of the budgets of low-income individuals and families than they do of those in the middle- and upper- income brackets. As indicated above, a further sharp increase in energy prices would undoubtedly be a source of significant hardship to those who have little, if any, discretionary income. Moreover, to be pragmatic, what the 'poor' lack in income they make up in numbers. In terms of political arithmetic, if not on the basis of equity, some apparent offset to the jump in energy costs would be required in order to obtain the reluctant acquiescence of voters to higher fuel costs.

In a unitary state the simplest means of providing amelioration would be through the elimination of the retail sales tax. In 1976-7 the tax raised about $5 billion for the provinces. The incidence of the one is probably not too different from that of the other, at least in consumers' minds. But the Canadian situation would make this a peculiar way to proceed. Retail sales taxes are imposed in all provinces except Alberta. For the federal government to collect an oil excise tax of national applicability and then to distribute the bulk of the proceeds to all the provinces except Alberta might be thought of as poetic justice by everyone except Alberta residents! The fact that Alberta has abundant revenue does not mean that some Alberta residents would not be hit by higher energy costs. From the view of voter perceptions it is also important that the offset to higher energy costs be available to all Canadian residents without regard to the province in which they are domiciled.

The withdrawal of the federal manufacturers' sales tax, widely acknowledged as an extremely bad tax, would not pose the same problem. (In fiscal 1978 this tax raised a little over $4 billion.) Furthermore, it would assist the domestic sales of the manufacturing industries of central Canada - industries where employment would suffer from higher oil prices and will also suffer from lower tariffs. Canadians in all provinces consume some manufactured goods, so that the benefit would be general. The resulting decline in the prices of these goods would offset to some extent the inflationary effects of the increase in oil prices.

However, such an offset would create some serious difficulties. From a political point of view a tax reduction in the manufacturers' sales tax would be less attractive than the abolition of the retail sales tax because most buyers are unaware of it. An immediate across-the-board reduction at the counter associated with a retail sales tax or, as I shall recommend, a refundable personal income tax credit would be much more obvious. Furthermore, the elimination of the manufacturers' sales tax would be capitalized in higher share prices for manufacturing corporations, and as we all know manufacturing is concentrated in the central provinces. Eliminating the manufacturers' sales tax would not appear to be an even-handed offset.

A universal refundable personal income tax credit, along the lines of that recently adopted for family income, seems far and away the best form of compensation for higher oil costs. Income-related, and with relatively gradual tax-back provisions which have minimum disincentive effects on work effort, the refundable credit can do what normal tax credits cannot do: put money in the hands of those who need it most - those with relatively little or no taxable income. By making the credit available, at least in part, prior to the increase in the price of oil, the complaint that the beneficiaries would lose everything before the money reached them would lose its force. It would apply to all residents of Canada without regard to their location.

The administrative machinery for implementing such a scheme is now already in place. Every Canadian would be aware of the offset and could recognize that the higher energy prices were not enriching producers or governments. I might add that proposals advanced to subsidize the energy costs of the poor would be counter-productive. One of the main reasons for moving to the world oil price is to raise oil costs and induce conservation and substitution. A scheme that provided government loans to finance the conversion or update of furnaces and the installation of storm windows and insulation, at interest rates and payback periods that were income-related, would also seem to make sense. But, except for major investment outlays that might exceed the conventional borrowing capacity of individuals, relieving the pocketbook of the taxpayers through reduced taxes or income supplementation would be infinitely preferable. In most instances the self-interest of the consumer will result in the most effective means of energy conversion being employed.

But what of the subsidies to the oil and gas industry? In my view the following propositions make sense:

1 Until the effects of higher oil prices on demand are more apparent, the rate of investment in extremely high-cost non-conventional oil should be geared to reducing Canada's dependence on foreign oil, not to energy self-sufficiency. We should not proceed on the assumption that X major projects should be undertaken now in order to eliminate forecast oil imports of Y by date Z. Provision should be made for buffer supplies to tide the nation over short-term shocks. A contingency plan might involve, for example, a temporary shutdown of certain petrochemical operations.

2 Frontier exploration should continue to be subsidized in order to increase the information available about the size of the nation's non-renewable energy stocks. However, the form of the subsidy should be altered to ensure that the bulk of the costs are not borne by all Canadians as taxpayers while a large share of the potential benefits are captured by a few shareholders.

3 The federal corporate income tax provisions relating to the petroleum industry should be overhauled and all concessions removed except for the accelerated writeoff of exploration and development costs. Given its capitalization in higher land prices, earned depletion is ineffective except as a transfer of wealth from Canadian residents generally to the residents of the producing provinces. It also creates barriers to entry into the industry. The withdrawal of earned depletion should only apply to future expenditures.

4 The elimination of the tax concessions (expenditures) buried in the corporate tax structure would increase federal revenues. The proceeds might be used to finance contingent repayment loans for approved non-conventional oil projects. Another, simpler alternative would be to subsidize the price of the output of such projects (e.g. pay a premium over and above the world oil price with no oil excise tax applicable either). The latter approach may not be effective if conventional borrowers need 'up front' money.

5 If the producing provinces were to roll back and fix their royalty rates at 1973 levels, the deductability of royalties for federal corporate tax

purposes should be restored and the provinces compensated for the revenue loss. The ultimate solution, however, is to move towards some form form of federal taxation of the provincial income from natural resource ownership. This should not be confined to non-renewable energy resources and certainly not to the oil and gas producing provinces.

6 The provinces, in the wake of the federal withdrawal of the special excise tax on gasoline, should gradually increase their taxes on gasoline and use the proceeds to subsidize urban transport. It would not seem to make sense for them to make this move until the effects of the crude oil excise tax had been absorbed.

Adoption of these proposals by the federal government would leave the producing provinces extraordinarily unhappy. So I would suggest the following. First, the petrochemical complex now located in Sarnia should be phased out and the producing provinces allowed to develop these industries should they so choose. At present the flow of residual oils in Ontario significantly undercuts the eastern market for natural gas. If the Sarnia petrochemical complex were phased out this problem would gradually disappear; but this would postpone for too long the substitution of natural gas for crude oil. I therefore propose that in the medium term exports of residuals be actively encouraged and, if necessary, the quantity made available in the eastern domestic market restricted. These measures would tend to induce an additional investment in eastern refining facilities designed to reduce the quantity of residuals produced.

Secondly, the price of domestic gas should be deregulated and the pipeline companies converted to common carriers. The quantity of gas exports should also be deregulated by the federal government and an export tax imposed slightly more than to close the gap between the domestic and US gas prices in a manner similar to the present crude oil export tax. The producing provinces should receive, in lieu of higher gas royalties, some share (most?) of the proceeds of this export tax.

The strategy just sketched, or something along similar lines would:

- minimize voter opposition to a move to world oil prices and provide even-handed compensation across Canada;
- minimize the coercion of a minority province and avoid the deployment of the most draconian federal measures;
- increase the efficiency of the incentives provided to the petroleum and other industries;

- not increase the politically costless funds available to provincial governments;
- have minimal effects on aggregate demand because the proceeds of the excise tax would be returned to individuals;
- deny a windfall gain to the supranational petroleum companies;
- and through more efficient tax incentives deny foreign shareholders a completely unwarranted gift of Canadian assets.

The reduction in the selling price of provincial land as a result of the withdrawal of earned depletion would reduce the revenues of the producing provinces. This would be more than offset by allowing the producing provinces to share in the proceeds of the proposed gas export tax. The Alberta Heritage Fund and the (similar but much more modest Saskatchewan Fund that encompasses potash and other resources) would continue to grow rapidly unless present provincial legislation were changed.

3 The challenge

A high degree of consensus on a public policy issue is a rare event in Canada. The enormous breadth of the country, the differences in the ethnic backgrounds and languages of the people in the various regions, the differences in mix of industries from region to region, and last but not least the climatic and topographic differences all make for great diversities of attitudes, beliefs, and economic interests. This diversity is one of the virtues of the country because under a federal system it is possible for Canadians in different parts of the country to 'do their own thing.' This surely must be one of the joys of being a Canadian: there is no such thing as a typical Canadian.

While a delight in so many ways, the low degree of national consensus makes it extremely difficult to generate national economic policies, particularly when the issue involves, as the energy issue does, a conflict not only between the interests of consumers and producers (as in the United States) but also between producing and consuming provinces, with the federal government seeking to resolve all these forces pushing in different directions.

Although there is not a typical Canadian, there too often seems to be a typical Canadian policy response in these circumstances. To resolve the conflict about what should be done we either do nothing or throw away our advantages. Being unable to agree on how to share the benefits of an economically efficient policy we forgo the potential gains. We either give away the advantage to non-residents or we build monumental symbols, usually of concrete and steel. In this case it is extremely important that the nation turn the advantage to good account and not squander it in pursuit of the unobtainable but costly goal of energy self-sufficiency, a policy that would shelter every kind of stupidity that could be rationalized while enriching the non-resident shareholders of the corporations that dominate the Canadian petroleum industry.

APPENDIX

Tables A.1 to A.9 are on the following pages.

TABLE A.1
Population, personal income, provincial income, unemployment rate, inflation rate
Ontario

	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	Compound Growth Rates 68/77	73/77
Population (millions)	7.306	7.452	7.637	7.703	7.824	7.939	8.094	8.226	8.265	8.374	1.53	1.34
Provincial income												
Total ($million)	23,496.3	260,040.5	27,692	30,760.6	34,706.2	40,017.1	46,929.1	52,167	59,451.4	66,130.8	12.18	13.38
Per capita	3,216.0	3,494.4	3,626.1	3,993.3	4,435.9	5,040.6	5,798.0	6,341.7	7,193.6	7,897.6	10.50	11.88
Gross domestic product												
Total ($million)	30,771.4	34,061.4	36,282.2	40,000.2	44,982.1	51,821.8	60,704.6	66,600.9	76,136.7	84,651.4	11.90	13.05
Per capita	4,211.8	4,570.8	4,750.8	5,192.8	5,749.3	6,527.5	6,790.2	8,057.2	9,212.5	10,109.4	10.22	11.56
Personal income												
Total ($million)	22,844	25,629	27,974	30,966	34,822	39,884	47,060	53,887	61,353	67,739	12.84	14.16
Per capita	3,126.8	3,439.2	3,663.0	4,020.0	4,450.7	5,023.8	5,814.2	6,550.8	7,423.7	8,089.7	11.14	12.65
Percentage of Canada												
Federal basic tax (PIT)[a]	45.17	45.88	45.89	45.51	44.73	43.83	42.41	41.18	40.41	40.26	-1.27	-2.10
Corp. taxable income (adj)[b]	45.23	45.57	45.86	46.14	45.24	44.69	42.23	38.76	38.26	36.38	-2.39	-5.01
Unemployment rate	3.6	3.2	4.4	5.4	5.0	4.3	4.4	6.3	6.2	7.0	7.67	12.96
Inflation rate (Toronto) (1971 = 100)	90.59	94.19	97.70	100	103.06	107.12	123.9	135.8	146.0	157.3	6.32	10.08

[a] Based on assessment as of the 31 December cutoff
[b] Based on assessments in respect of a single taxation year only

SOURCE: Statistics Canada (11-003E 1963-1977; 17-201 January 1979; 13-213 January 1979), Ministry of Finance

TABLE A.2
Population, personal income, provincial income,
unemployment rate, inflation rate
Alberta

ALBERTA

	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	Compound Growth Rates 68/77	73/77
Population (millions)	1.526	1.561	1.600	1.628	1.655	1.683	1.714	1.768	1.838	1.900	2.47	3.08
Provincial income												
Total ($million)	4,528.3	5,038.5	5,478.5	6,029.8	6,922.0	8,774.2	11,499.9	14,446.6	16,951.5	18,923.0	17.22	21.18
Per capita	2,967.4	3,227.8	3,424.1	3,703.8	4,182.5	5,213.4	6,697.7	8,171.2	9,222.8	9,961.1	14.40	17.57
Gross domestic product												
Total ($million)	5,828.7	6,483.7	7,033.5	7,724.6	8,790.6	11,029.1	15,366.4	18,353.8	21,077.5	23,479.3	16.74	20.79
Per capita	3,819.6	4,153.6	4,395.9	4,744.8	5,311.5	6,553.2	8,965.2	10,381.1	11,467.6	12,359.5	13.94	17.19
Personal income												
Total ($million)	4,111	4,589	4,953	5,534	6,267	7,471	9,019	11,085	12,961	14,672	15.18	18.38
Per capita	2,694.0	2,939.8	3,095.6	3,399.3	3,786.7	4,439.1	5,262.0	6,269.8	7,051.7	7,723.3	12.41	14.85
Percentage of Canada												
Federal basic tax (PIT)[a]	6.99	7.11	7.17	7.17	7.26	7.36	7.93	8.75	9.25	9.62	3.61	6.92
Corp. taxable income (adj)[b]	7.91	7.34	8.71	9.07	9.40	10.27	15.02	20.69	18.85	22.61	12.38	21.81
Unemployment rate	3.3	3.4	5.1	5.7	5.6	5.3	3.5	4.1	4.0	4.5	3.51	-4.01
Inflation rate (Calgary) (1971 = 100)	91.03	94.77	97.66	100	103.9	110.61	120.9	134.6	145.8	158.0	6.32	9.32

a. Based on assessment as of the 31 December cutoff
b. Based on assessments in respect of a single taxation year only

SOURCES: Statistics Canada (11-003E 1963-1977; 17-201 January 1979; 13-213 January 1979), Ministry of Finance

TABLE A.3
Government revenue, expenditure and surplus or deficit
Ontario ($million)

	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	Compound Growth Rates 68/77	73/77
Total revenue	3557	4171	4986	5562	6053	6887	8252	9033	10357	11671	14.11	14.10
Total expenditure	3322	3799	4829	5668	6152	6830	8119	10139	11435	12501	15.86	16.31
Savings (deficit)	235	372	157	(106)	(99)	57	133	(1106)	(1078)	(830)	--	--
Capital consumption allowance	89	99	108	119	131	156	209	243	284	329	15.64	20.51
Gross capital formation	248	253	285	328	412	445	535	572	557	601	10.34	7.80
Surplus (deficit)	76	218	(20)	(315)	(380)	(232)	(193)	(1435)	(1351)	(1102)	--	--

SOURCE: Statistics Canada (13-213, January 1979)

TABLE A.4
Government revenue, expenditure and surplus or deficit
Alberta

	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	Compound Growth Rates 68/77	73/77
					(millions of dollars)							
Total revenue	711	875	1051	1200	1335	1685	2750	3324	4046	5059	24.36	31.63
Total expenditure	791	931	1099	1245	1402	1564	1940	2419	2801	3440	17.74	21.78
Savings (deficit)	(80)	(56)	(48)	(45)	(67)	121	810	905	1245	1619	--	91.26
Capital consumption allowance	35	39	43	47	50	59	80	94	111	130	15.70	21.84
Gross capital formation	81	87	94	111	113	145	226	309	250	306	15.91	20.53
Surplus (deficit)	(126)	(104)	(99)	(109)	(130)	35	664	690	1106	1443	--	153.40

SOURCE: Statistics Canada (13-213, January 1979)

TABLE A.5
Net sources and uses of funds for fiscal year ending 31 March, Ontario

	1968 N/A	1969 N/A	1970	1971	1972	1973	1974	1975	1976	1977[a]
					(millions of dollars)					
Surplus or (deficit)			155.4	(20.5)	(499.6)	(336.3)	(308.2)	(719.2)	(1388.2)	(965.4)
Receivables or payables			(3.7)	11.8	.413	12.9	(8.8)	1.2	(20.2)	(26.2)
Loans and advances			(302.2)	(111.5)	(61.7)	78.6	(193.8)	66.6	(46.1)	(61.8)
Treasury bills			(8.9)	2.4	90.00	61.9	(172.7)	(79.2)	325.0	(195)
Bonds - debentures, obligations			350.0	-	-	-	-	-	-	-
1) Canada Pension Plan			N/A	476.0	498.3	536.4	607.0	701.8	784.0	812.8
2) Saving Bonds			N/A	-	-	-	-	-	-	-
3) Other			N/A	(247.1)	(21.0)	101.7	115.3	17.7	472.9	609.9
Other			(182.6)	(61.0)	(101.4)	(198.9)	(90.0)	(33.4)	(69.9)	154.9
Total			8.0	50.2	5.1	255.0	(51.7)	(44.5)	57.5	28.6

a Preliminary Estimates: Statistics Canada (Catalogue No. 68-209, 1976)

SOURCE: Statistics Canada (Catalogue No. 68-209, 1970-6)

TABLE A.6
Net sources and uses of funds for fiscal year ending 31 march, Alberta

	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977[a]
	N/A	N/A								
					(millions of dollars)					
Surplus or deficit			(18.4)	(92.3)	(129.7)	(23.3)	248.3	862.6	707.6	924.4
Receivables or payables			(5.1)	(.87)	16.0	(10.7)	15.8	51.5	9.0	(83.7)
Loans and advances			(7.8)	(2.6)	3.3	(21.8)	29.2	(93.7)	114.6	240.5
Treasury bills			-	(.326)	(.484)	(.492)	99.3	(.036)	54.9	(151.8)
Bonds - debentures, obligations			(11.8)	-	-	-	-	-	-	-
1) Canada Pension Plan			N/A	82.3	87.1	94.6	108.2	126.6	143.4	150.7
2) Saving Bonds			N/A	-	(.036)	-	.036	-	-	-
3) Other			N/A	34.8	13.4	(18.7)	(171.7)	(248.1)	(702.9)	(1242.8)
Other			42.8	5.1	6.7	57.7	(149.0)	(116.3)	(288.0)	69.7
Total			(.315)	18.3	(3.8)	77.3	180.2	582.6	(300.5)	(92.9)

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a Preliminary Estimates: Statistics Canada (Catalogue No. 68-209, 1976)

SOURCE: Statistics Canada (Catalogue No. 68-209, 1970-6)

TABLE A.7

Tax bases, 1976

Tax bases	UNITS	ONT.	ALTA.	10 PROV	10 PROV - ONT.	10 PROV - ALTA.	10 PROV - (ONT & ALTA)
Assessed federal individual income tax (basic tax)	$000	6,920,390	1,584,543	17,127,577	10,207,187	15,543,034	8,622,644
Allocated corporate taxable income	$000	5,930,593	2,086,142	14,606,186	8,675,593	12,520,044	6,589,451
Value of sales by retail establishment	$000	27,428,412	8,353,561	74,442,086	47,013,674	66,088,525	38,660,113
Motive fuel sales gals	103	2,949,432,481	796,264,995	807,070,315	5,121,270,634	7,274,438,120	4,325,005,639
Sales of alcoholic beverages gals	103	22,651,690	5,941,387	59,673,943	37,022,253	53,732,556	31,080,866
Total personal.and corporate income	$000	150,036,079	42,903,526	374,410,250	224,374,171	331,506,724	181,470,645

SOURCE: Ministry of Finance

TABLE A.8
Revenues by province, fiscal year 1976-7 ($100)

Source	NFLD.	P.E.I.	N.S.	N.B.	QUE.	ONT.	MAN.	SASK.	ALTA.	B.C.	TOTAL
Personal income tax	107,815	17,242	172,551	146,494	3,279,519	2,200,175	291,314	277,097	439,265	725,316	7,656,788
Corporate income tax	26,662	3,548	49,700	30,813	465,001	785,480	111,858	91,501	384,487	214,601	2,163,651
General and miscellaneous sales tax	151,827	22,116	152,288	121,909	1,640,238	1,944,636	214,208	184,955	17,488	715,781	5,165,446
Motive fuel taxes (gross)	37,665	8,405	57,890	49,582	428,450	587,091	72,619	59,983	91,356	178,517	1,571,558
Alcoholic beverages	33,719	7,510	54,681	36,402	219,551	386,908	64,353	59,692	115,700	163,200	1,141,716
Provincial taxes (other) + miscellaneous provincial	31,255	15,430	24,302	66,107	694,895	612,196	66,083	101,122	112,817	317,963	2,042,170

SOURCE: Ministry of Finance

TABLE A.8 continued

	10 PROV - ALTA	10 PROV - ONT	10 PROV - (ONT + ALTA)
Personal income tax	7,217,523	5,456,613	5,017,345
Corporate income tax	1,779,164	1,378,171	993,684
General and miscellaneous sales tax	5,147,958	3,220,810	3,203,322
Motive fuel taxes (gross)	1,480,202	984,467	893,111
Alcoholic beverages	1,026,016	754,868	639,108
Provincial taxes (other) + miscellaneous provincial	1,929,353	1,429,974	1,317,157

SOURCE: Ministry of Finance

TABLE A.9

Effective tax rates

	ONT.	ALTA.	10 PROV	10 PROV - ALTA	10 PROV - ONT
Personal income tax/assessed federal individual income tax (basic tax)	0.3179264463	0.2772187312	0.447044436	0.4643574092	0.5345853858
Corporate income tax/allocated corporation taxable income	0.1324454401	0.184305287	0.1481325104	0.1421052514	0.1588561151
General & miscellaneous sales tax/value of sales by retail establishments	0.0708985996	0.0020934785	0.069388763	0.0778948842	0.0685079409
Motive fuel taxes/motive fuel sales	0.0001990522	0.0001147306	0.0001947238	0.0002034799	0.000192231
Alcoholic beverages/sales of alcoholic beverages	0.0170807564	0.0194735674	0.0191325718	0.0190948668	0.0203879542
Provincial taxes (other) & miscellaneous provincial revenue/total personal & corporate income	0.0040803252	0.0026295508	0.0054543646	0.0058199513	0.0063731667

Panelists and Speakers

PETER A.T. CAMPBELL
Vice-President and Director of Wood Gundy Limited in the Corporate and Government Finance Areas.

THOMAS J. COURCHENE
Professor of Economics at the University of Western Ontario.

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JOHN A.G. GRANT
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DOUGLAS G. HARTLE
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